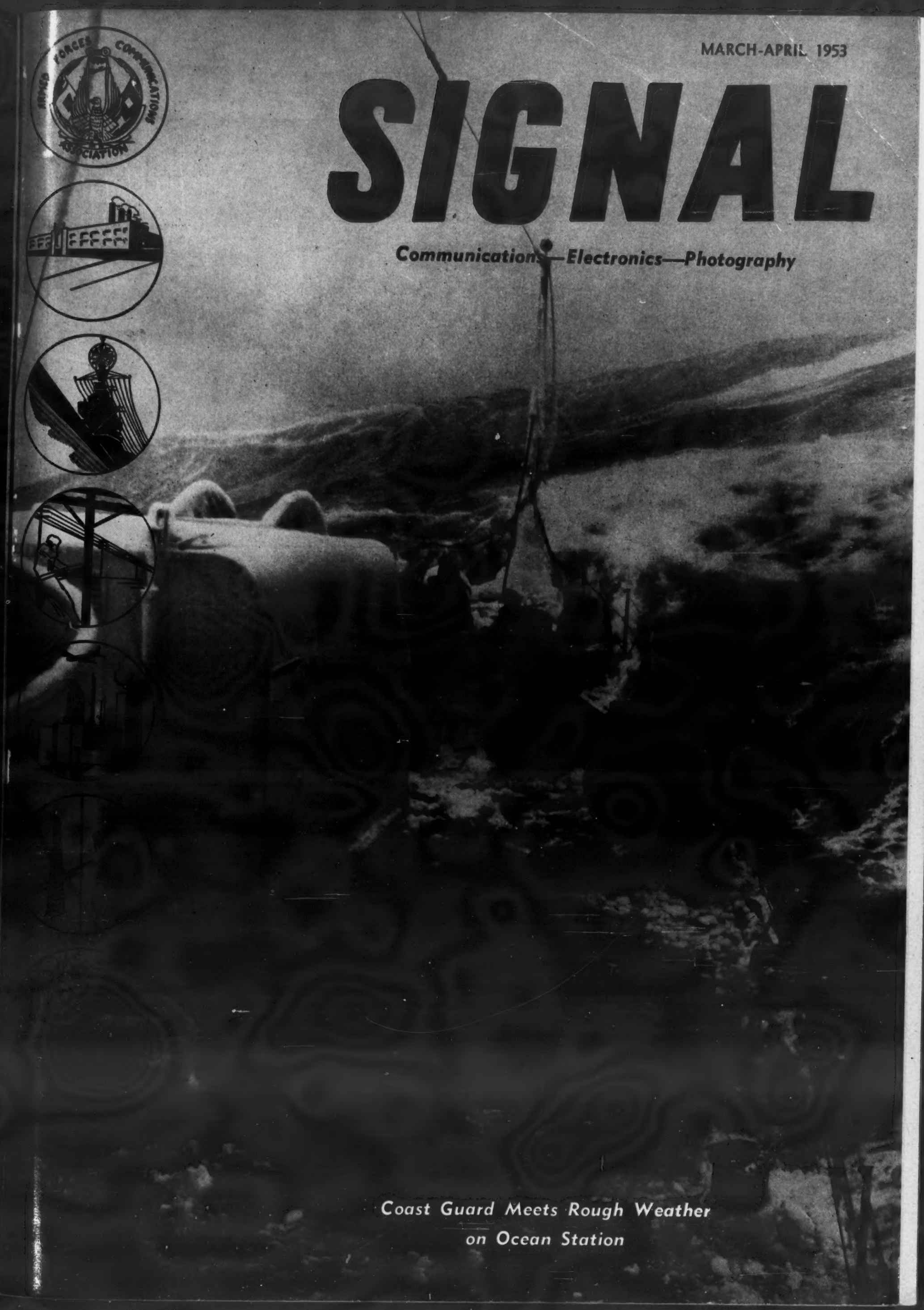
MARCH-APRIL 1953

SIGNAL

Communications—Electronics—Photography



Coast Guard Meets Rough Weather on Ocean Station

FACSIMILE

The Eagle

A windjammer, lazy in a summer breeze—a flat top, knifing through a sullen sea . . . have this in common . . . Times Facsimile equipment . . . for the speedy reception of weather charts and other important information. ★ ★ ★ ★ ★ ★ ★ The ship illustrated is "The Eagle", a full rigged 295 ft Coast Guard training bark based at the U. S. Coast Guard Academy in New London, Connecticut.

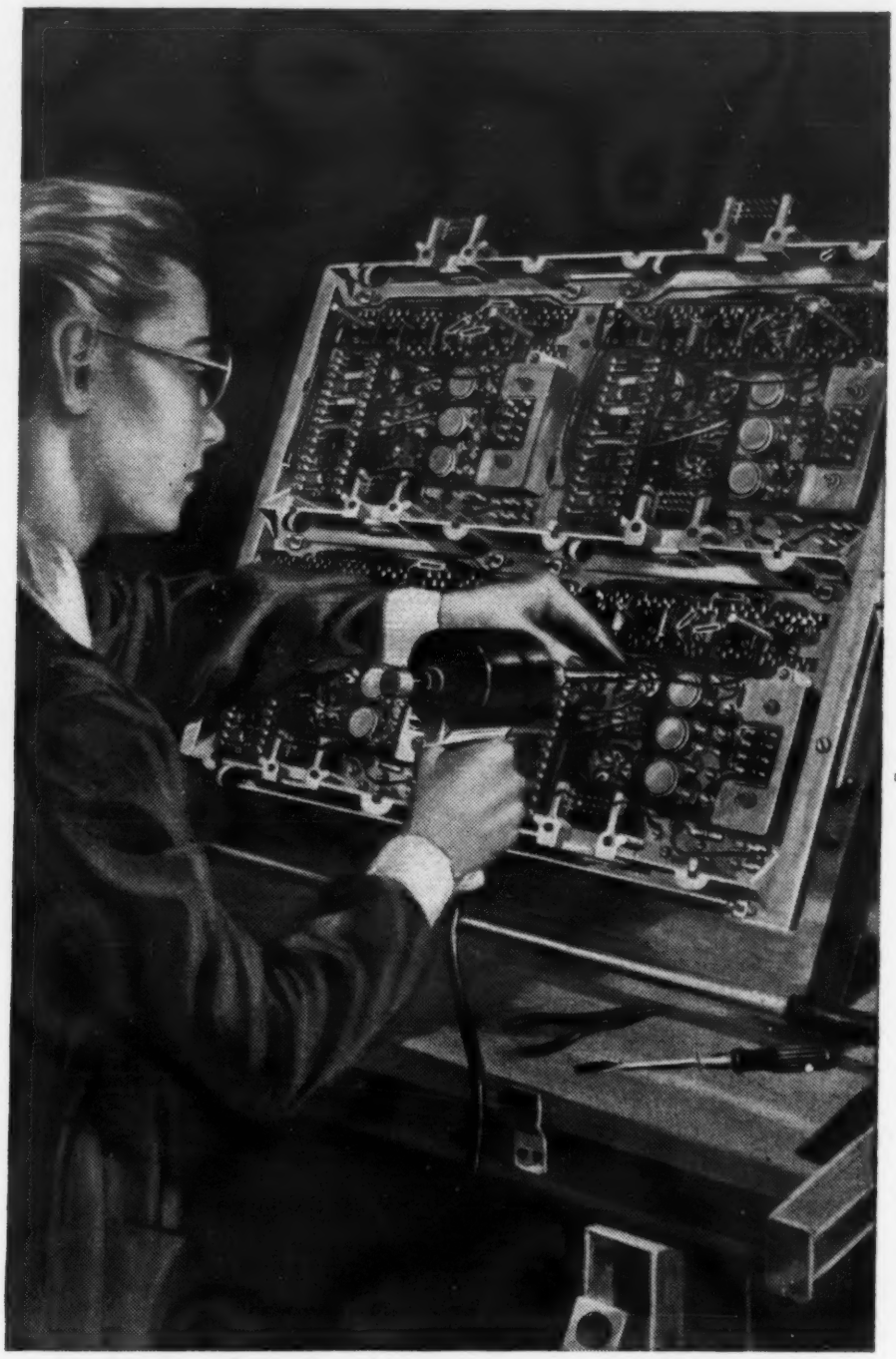
TIMES FACSIMILE

CORPORATION

540 W. 58th Street, New York 19, N. Y. · 1523 L Street, N.W., Washington 5, D. C.

DESIGNERS AND MANUFACTURERS OF FACSIMILE COMMUNICATIONS EQUIPMENT FOR OVER 15 YEARS

"Look-alikes?"



...yes, but one directs guns, the other directs telephone calls!

Each of these units of electronic equipment is important to national defense in its own way. Together they symbolize the double-barrelled defense job being done by Western Electric — the manufacturing unit of the Bell Telephone System for the past seventy years.

With the help of thousands of sub-contractors, large and small — located in all parts of the country — we're turning out special military communications and electronic equipment for the Armed Forces. For example: a radar fire control system for anti-aircraft guns, a part of which is seen in the left-hand picture.

Naturally, we're also busy on our regular job of making telephone equipment — such as the dial switching unit at the right — to help keep the Bell telephone network going and growing in the nation's service.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Here's what's happening in electronics at CROSLEY

Did you know *that as far back as 1922 Crosley was pioneering in electronics?*

. . . that over 30 years ago Crosley brought out the first popular-priced radio?

. . . that one of the first three radio stations in the country ever to be granted a commercial license was Crosley's WLW, Cincinnati—"The Nation's Station"?

Today, 32 years later, the famous CROSLEY trade name appears not only on radios, television sets and appliances of almost every description in millions of homes throughout the country, but on some of the most vital military equipment, too.

Crosley and its parent company, AVCO Manufacturing Corporation, are supplying the Army Signal Corps with the lightweight RT-68 Receiver-Transmitter Units, as a part of the AN/GRC-3 Equipment and also are producing the new AN/GRC-9 Communication Systems.

Crosley is also turning out complete wing and empennage assemblies for large aircraft . . . supplying both radial engines and jet-turbine components to the Air Force.

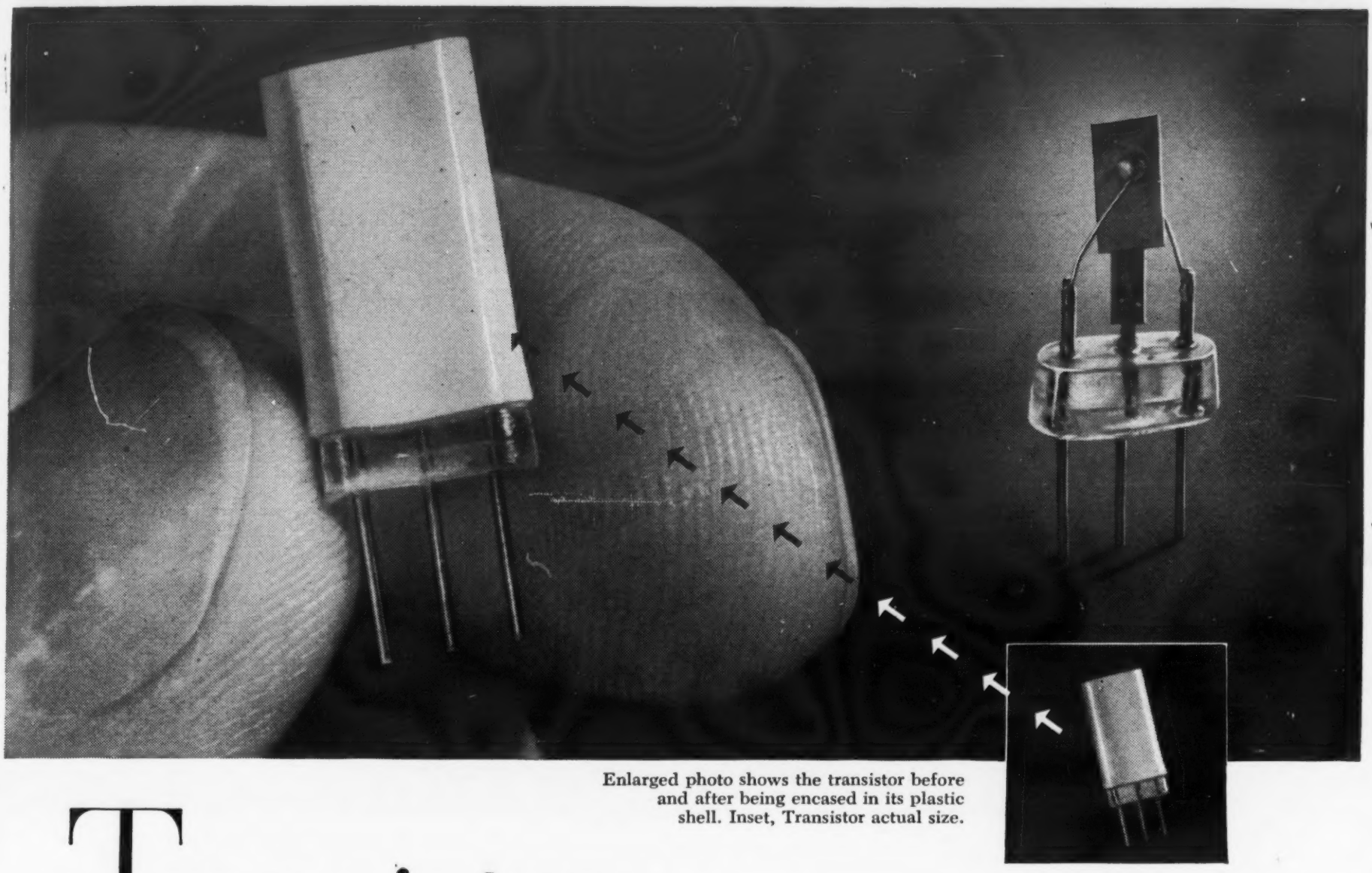
Production of armament control systems for the Navy is in full swing, too. Crosley is one of the nation's largest manufacturers of over-all military products.

Receiver-Transmitter RT-68, *being operated above from a jeep installation, can also be used for semi-fixed and portable installations. When powered and equipped with antenna, microphone, and headset, these Crosley-produced radio sets provide two-way communication with other sets in the field.*

RADIO SET AN/GRC-3
New Type Frequency Modulation VHF Mobile Radio Equipment for use by the Armed Forces and Designed Primarily for Short Range Operation Within and Between Armored Artillery and Infantry Units.
LOCAL CONTROL UNIT
RETRANSMISSION UNIT
INTERPHONE AMPLIFIER
REMOTE CONTROL UNIT

The AN/GRC-3 radio set *is a complete relay and repeater transmission system for short-range operation within and between Armored Artillery and Infantry units. It uses the compact RT-68 Unit produced by Crosley as a central part for transmission and reception of FM signals.*

Crosley's Plant #7, *located in Cincinnati, produces complete communications systems for the Army Signal Corps. Here, too, hundreds of Crosley engineers are at work on intensive research and development programs for the constant improvement of Army Signal Corps and other Armed Forces electronics equipment.*



Enlarged photo shows the transistor before and after being encased in its plastic shell. Inset, Transistor actual size.

Transistor_

mighty mite of electronics

Increasingly you hear of a new electronic device—*the transistor.* Because of growing interest, RCA—a pioneer in transistor development for practical use in electronics—answers some basic questions:

Q: ***What is a transistor?***

A: The transistor consists of a particle of the metal germanium imbedded in a plastic shell about the size of a kernel of corn. It controls electrons in solids in much the same way that the electron tube handles electrons in a vacuum. But transistors are not interchangeable with tubes in the sense that a tube can be removed from a radio or television set and a transistor substituted. New circuits as well as new components are needed.

Q: ***What is germanium?***

A: Germanium is a metal midway between gold and platinum in cost, but a penny or two will buy the amount needed for one transistor. Germanium is one of the basic elements found in coal and certain ores. When painstakingly prepared, it has unusual electrical characteristics which enable a transistor to detect, amplify and oscillate as does an electron tube.

Q: ***What are the advantages of transistors in electronic instruments?***

A: They have no heated filament, require no warm-up, and use little power. They are rugged, shock-resistant and unaffected by dampness. They have long life. These qualities offer great opportunities for the miniaturization, simplification, and refinement of many types of electronic equipment.

Q: ***What is the present status of transistors?***

A: There are a number of types, most still in development. RCA has demonstrated to 200 electronics firms—plus Armed Forces representatives—how transistors could be used in many different applications.

Q: ***How widely will the transistor be used in the future?***

A: To indicate the range of future applications, RCA scientists have demonstrated *experimental* transistorized amplifiers, phonographs, radio receivers (AM, FM, and automobile), tiny transmitters, electronic computers and a number of television circuits. Because of its physical characteristics, the transistors qualify for use in lightweight, portable instruments.

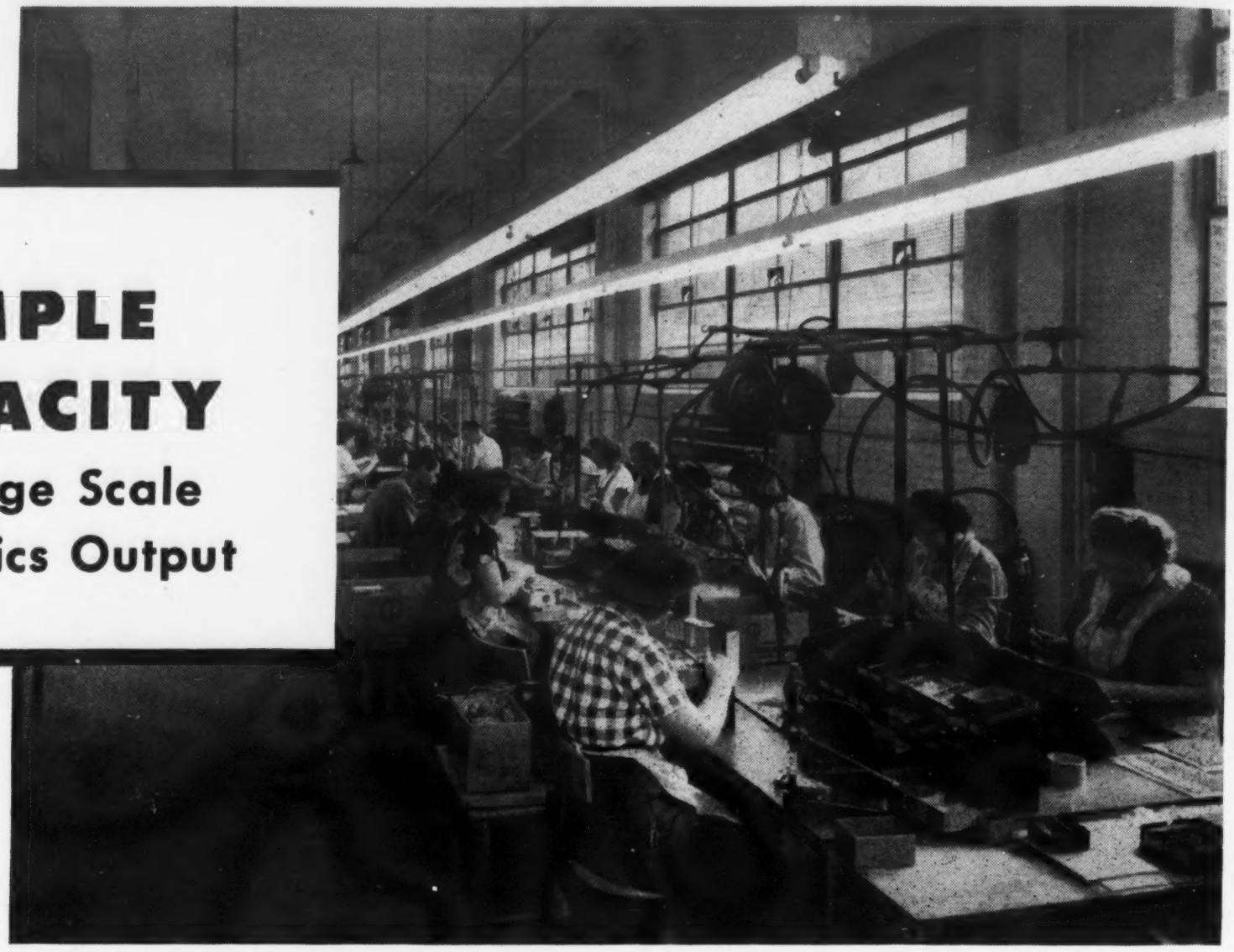
* * *

RCA scientists, research men and engineers, aided by increased laboratory facilities, have intensified their work in the field of transistors. The multiplicity of new applications in both military and commercial fields is being studied. Already the transistor gives evidence that it will greatly extend the base of the electronics art into many new fields of science, commerce and industry. Such pioneering assures finer performance from any product or service trademarked RCA and RCA Victor.

RADIO CORPORATION OF AMERICA

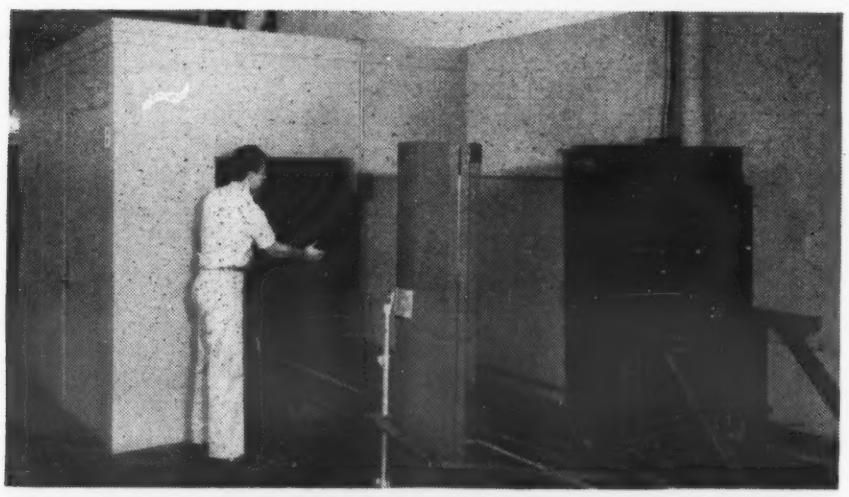
World leader in radio—first in television

AMPLE CAPACITY
for Large Scale Electronics Output



The manufacturing skills and facilities which secure Admiral's leading position in television are available for additional government electronics output. Admiral has demonstrated the ability to move quickly from plans to production. Volume production is currently under way on government contracts in the fields of radiac, radar and radio receiving and transmitting apparatus.

At Admiral, large scale manufacturing capacity is supported by extensive laboratory facilities. A separate laboratory, devoted exclusively to military electronics, is equipped and staffed for original research as well as development and engineering. Facilities include an AEC approved cobalt 60 source of gamma radiation, rated at 12 curies. Inquiries are invited regarding development and production of all types of electronics equipment.



Admiral's engineering laboratory includes a modern printed circuit department, equipped for research, development and production of any type of photo-etched or silk screen printed circuits.

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Phone: EXecutive 3-3033

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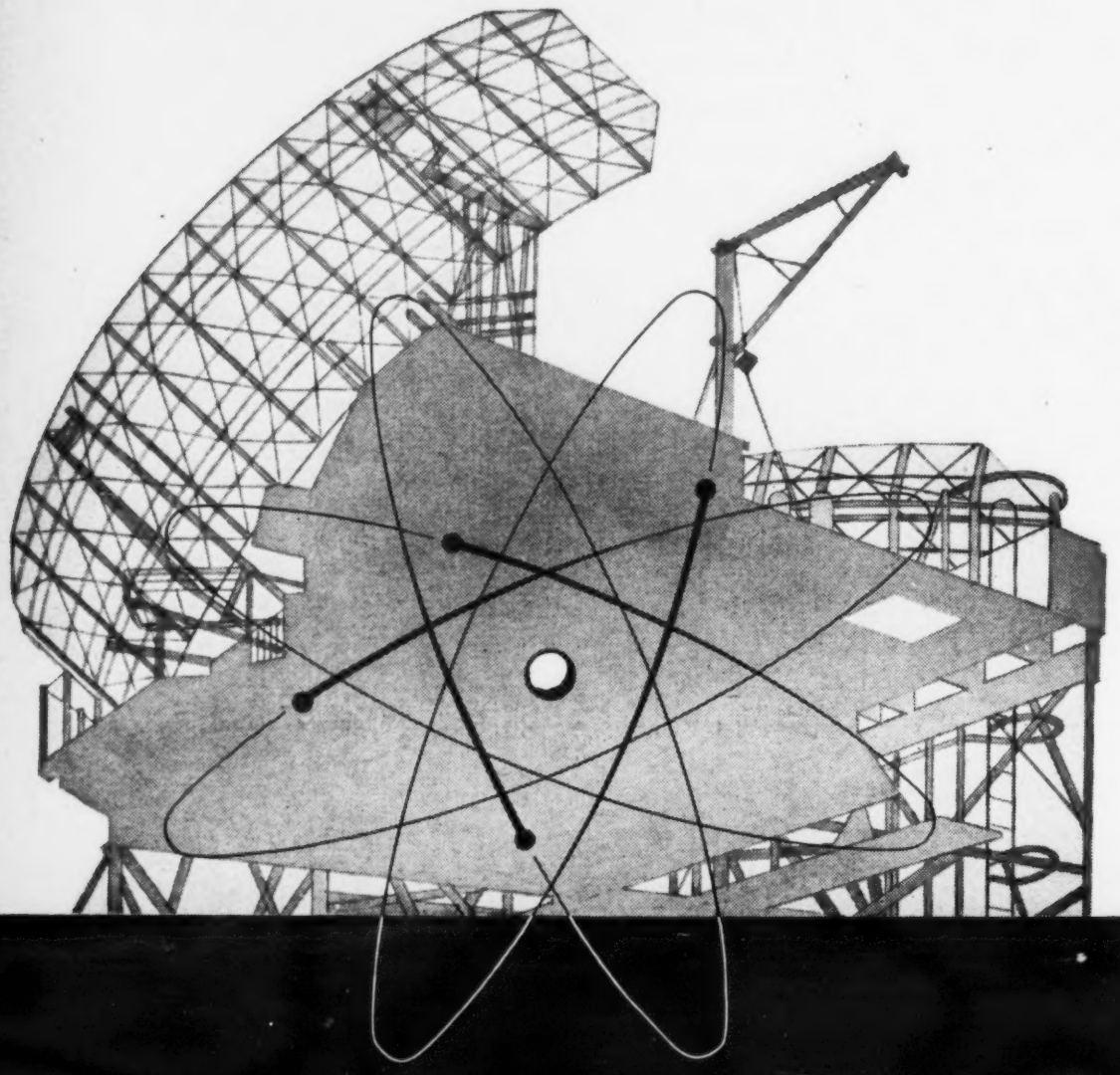


Devoted entirely to the manufacture of light military electronic equipment

ELECTRONICS DEFENSE PLANT!

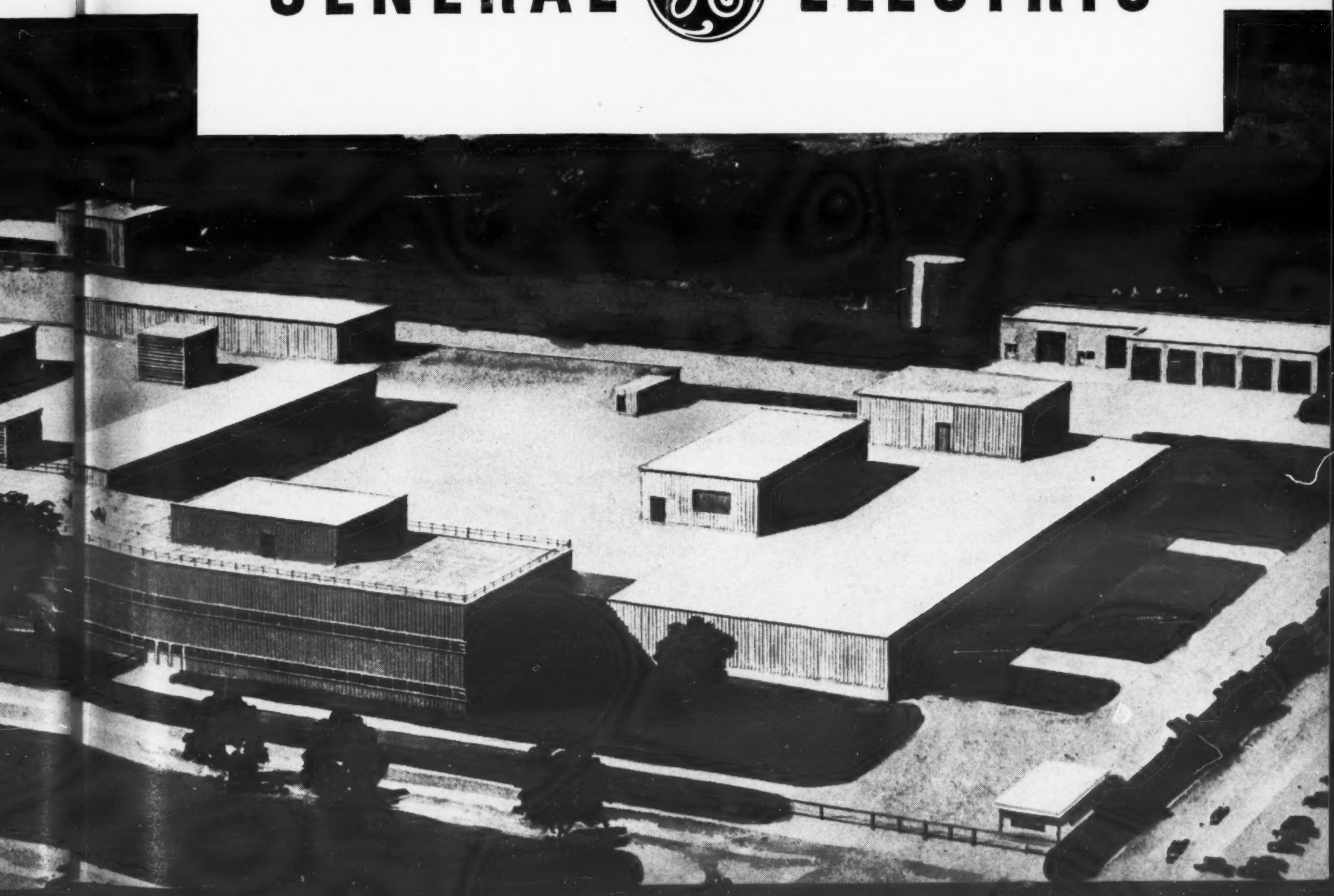
At Utica, New York, the General Electric Company has dedicated a new rampart of defense to the service of our nation . . . its multi-million dollar Light Military Electronics Plant at French Road.

Nothing has been spared to make this installation the finest of its type. Here scientists and engineers highly trained in the techniques of military electronics equipment design and production will work to serve all branches of the Service. Embodying test facilities without parallel in the industry, an automatically controlled conveyor system and over 275,000 square feet of manufacturing area on a single floor, this new plant is self-sufficient to a maximum degree.

An illustrated book describing this latest and most modern General Electric plant is available on request. Write for a copy of "Strictly for Defense." *General Electric Company, Section 1243, Electronics Park, Syracuse, New York.*

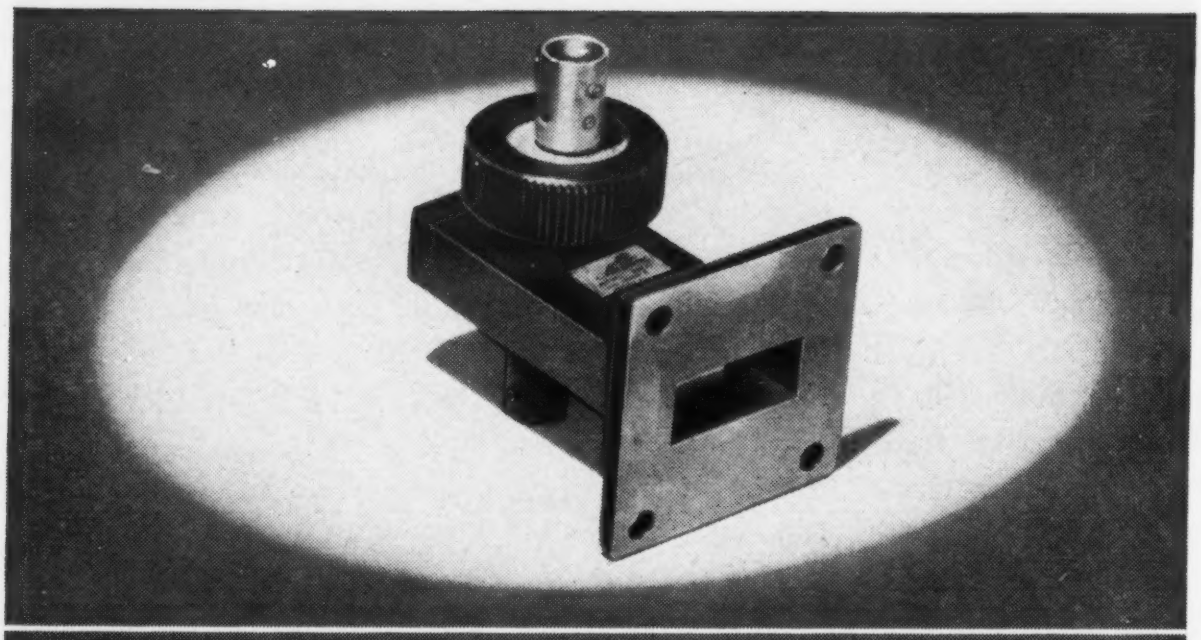
You can put your confidence in—

GENERAL ELECTRIC



New X-Band Test Equipment

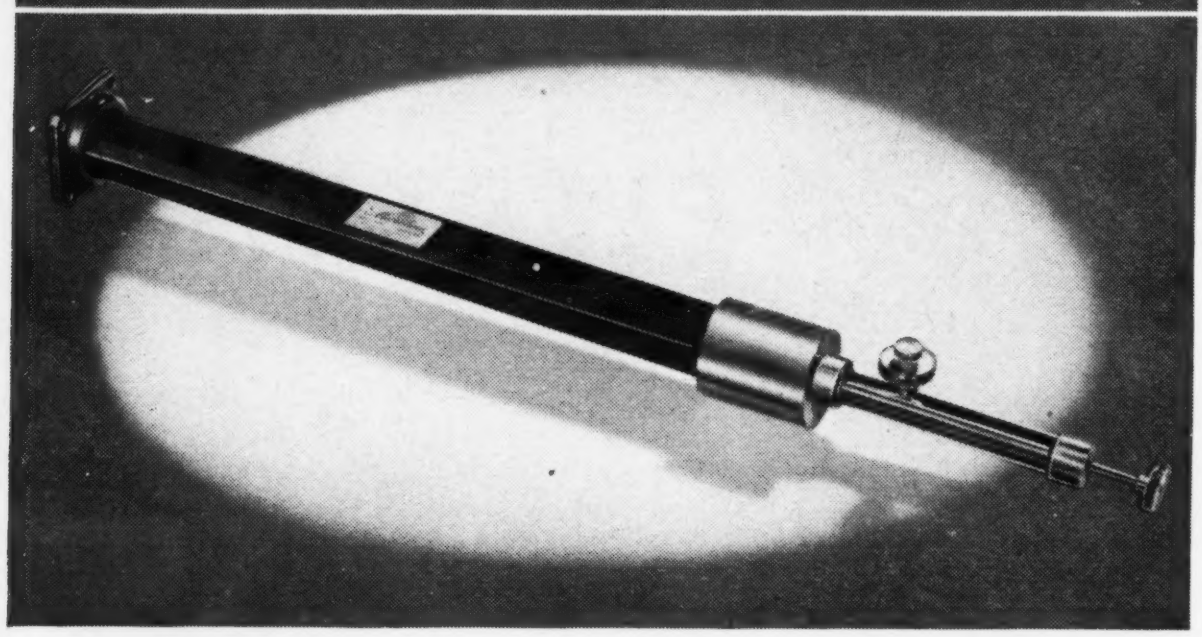
ADDITIONAL INSTRUMENTS
ADDED TO MICROLINE*



Model 219C Waveguide Thermistor Mount

This instrument is used in conjunction with accessory equipment to measure and monitor microwave power at average power levels as low as 10 microwatts. It is particularly useful in the measurement of pulsed power. This thermistor mount is recommended for use with the Microline Model 123B Wattmeter Bridge.

Frequency Range	8.5 – 9.6 kmc.
Maximum VSWR	1.5
Operating Resistance	135 ohms
Maximum Power Rating	10 mw.
Waveguide Size	RG-52/U (1" x ½")



Model 495 Adjustable Termination

This instrument is specially adapted for use in precise microwave measurements where the quality of excellent impedance matching over a broad band is essential. The design of Model 495 provides for independent control of phase and amplitude of the reflection coefficient of the load. It is particularly useful in applications requiring a termination of minimum power reflection, a movable termination where the reflection from the termination can cause error in measurements, or as a means of matching low standing wave ratios to obtain the smallest possible reflections.

Frequency Range	8.1 – 12.4 kmc.
VSWR Range	1.005 – 1.15
Phase Variation	360°
Waveguide Size	RG-52/U (1" x ½")
Power Rating	5w.

Our nearest district office will be glad to supply complete information upon request.

*T.M. REG. U.S. PAT. OFF.

OTHER X-BAND MICROLINE INSTRUMENTS

MODEL	INSTRUMENT
167A, 486A	Adapter
377	Adjustable Short
173, 174, 183 152A, 134A	Attenuator
184	Barretter Mount
170, 171	Waveguide Bends
360A	Detecting Section
234, 235, 236	Directional Coupler
126, 273	Frequency Meter
145	Impedance Meter
379	Mixer
165A, 166A	Waveguide Tee
406	Magic Tee
150, 246	Termination
146, 178	Transformer

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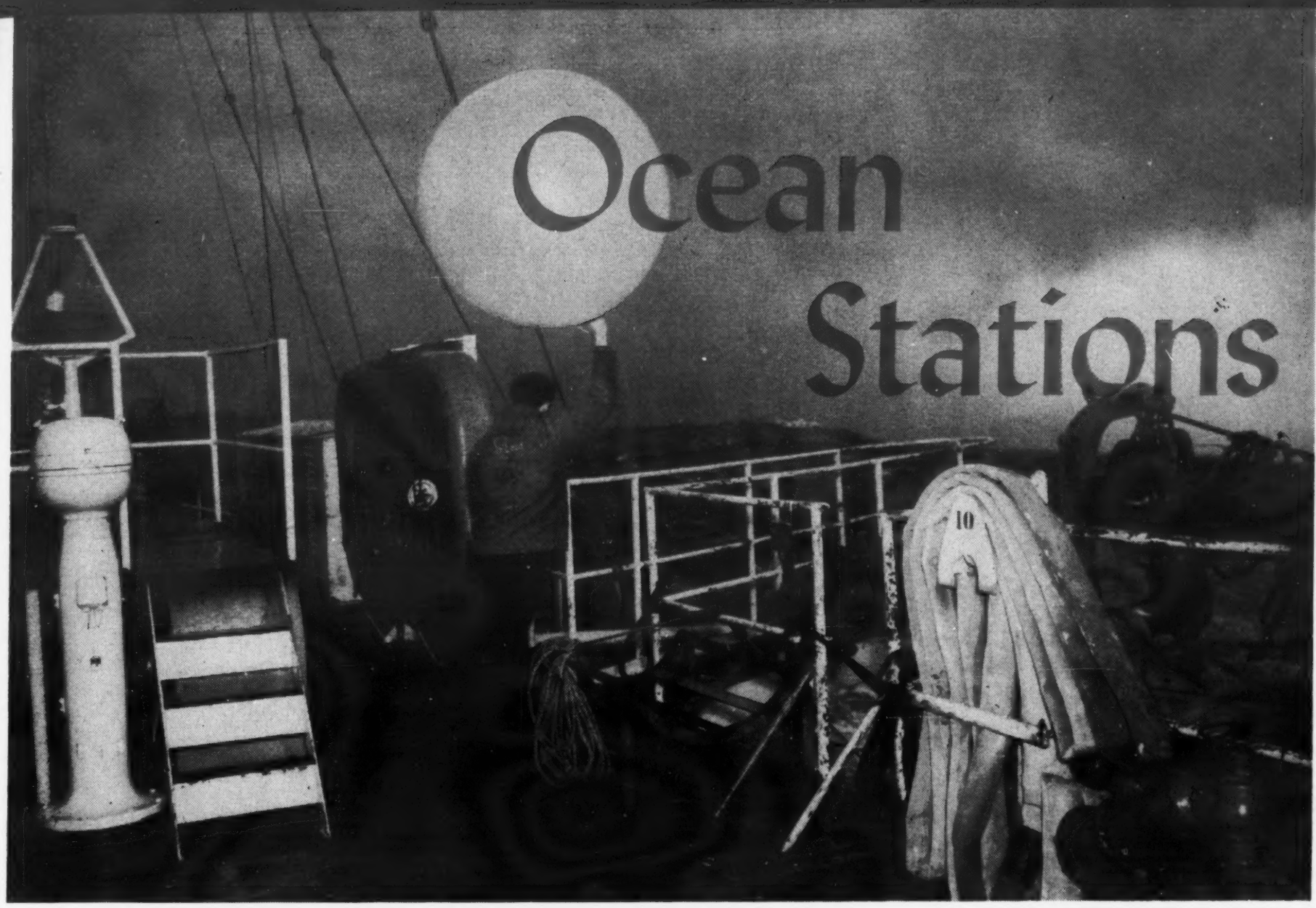


The U. S. Coast Guard maintains a constant watch on the high seas to furnish weather information and navigational positions to aircraft or ships and to provide search and rescue teams.

by

Commander Robert Wilcox, USCG

Assistant, Chief of
Communications Division
U. S. Coast Guard

At the meeting of the International Meteorological Committee, held in London 1921, Colonel E. Delcambre, Director of the Meteorological Service of France, proposed the establishment of a stationary ship located in the North Atlantic between 25° and 35° and 49° North for purposes of weather observation and forecasting to benefit merchant shipping and trans-Atlantic air investigation, which "will, without doubt, materialize in the near future." The foresight of this French Colonel has been justified to a degree even he did not envisage, for today instead of one there are fifteen strategically located positions in the North Atlantic and Pacific Oceans where ships of Canada, France, the Netherlands, Norway, Japan, the United Kingdom and the United States carry out as one of several functions the task originally proposed by Colonel Delcambre. These positions are known as Ocean Stations. Each Ocean Station is an area enclosed by a square two hundred and ten miles to a side centered on the designated position and oriented with its axes North-South and East-West. These squares are further subdivided into ten mile square grids. The ship manning an Ocean Station is known as an Ocean Station Vessel and maintains, whenever practicable, a position within the center square of the grid. Normally ships remain on station twenty-one days and during that period may only move off station without relief when in the opinion of the Commanding Officer such action is required in the interest of search and rescue or is required by the provisions of the Convention for the Safety of Life at Sea.

In the United States the Ocean Station Vessel Program began in 1940 as the Ocean Weather Program by direction of the President at the request of the Secretary of Agriculture, as a joint Weather Bureau-Coast Guard operation; the Coast Guard providing the ships and communication facilities, and the Weather Bureau providing the observational personnel and the special instruments and equipment required. This arrangement, with modifications from time to time, has continued to date. The number and locations of Ocean Weather Stations were originally determined by the Weather Bureau in consultation with the Civil Aeronautics Administration and the United States commercial airlines. During World War II, the number and locations were determined by cognizant committees under the Joint Chiefs of Staff. With the establishment of the Air Coordinating Committee, the number and locations of U. S. Ocean Weather Stations in the North Atlantic, which in 1949 were redesignated as Ocean Stations, have been recommended by that Committee to the Provisional International Civil Aviation Organization and its successor, the International Civil Aviation Organization, while the number and locations of the United States manned Pacific Ocean Stations continues as a function of the Joint Chiefs of Staff. International coordination of the program in the Pacific has been effected by bi-lateral agreements with Canada, and with Japan.

In the North Atlantic, the Coast Guard in conjunction with the Weather Bureau has from the earliest inception of the program manned all Ocean Stations for which the United States

has responsibility. At this time, the Coast Guard provides the ships and facilities, except for the facilities furnished by the Weather Bureau, for five stations. A sixth station is shared with the Netherlands which provides one ship, and the Coast Guard two for this station. The Commander, Eastern Area, U. S. Coast Guard with Headquarters in New York, N. Y., exercises control and direction of the ships manning these six Ocean Stations.

In the Pacific Ocean the United States Navy originally manned all Ocean Stations, but in 1946 as ships, personnel, facilities, and funds became available the Coast Guard commenced to relieve the Navy until at this date all five United States Ocean Stations are manned by Coast Guard ships under the control and direction of the Commander, Western Area USCG, with Headquarters in San Francisco, Calif.

United States Ocean Station Vessels, when on station, are assigned the following primary tasks: (a) Obtain and furnish meteorological observations; (b) Function as navigational aids to aircraft; (c) Be prepared to and engage in search and rescue operations as necessary.

Meteorological Observations

Meteorological observations are made by personnel of the U. S. Weather Bureau with the assistance of Coast Guard personnel and certain electronic facilities. These observations are of the following categories:

(a) Observations of surface meteorological conditions, including wind direction and velocity, sea-level atmospheric pressure, cloud types and amounts, sea condition, visibility, temperatures, weather, etc.

(b) Radar winds-aloft observations, called RAWINS in the jargon of the meteorologist, made by means of a balloon-borne target and the ship's air search radar.

(c) Upper-air observations of temperature, pressure, humidity, direction and velocity, or RAOBS, made by use of a balloon borne radiometeorgraph (radiosonde) and radar reflector in conjunction with the associated radiosonde receiver and recording equipment, and an air search radar on board the ship.

(d) Upper-air observations of wind directions and velocities obtained by following the path of a balloon inflated so as to ascend at a predetermined rate by means of a theodolite. Such observations are called PIBALS.

(e) Observations of clouds, rain areas, and frontal systems from visual inspection of their appearance on the PPI radar scope—RAREPS. Photographs are made of unusual weather presentations.

To enhance the morale of personnel and to promote improvements in technique, a spirit of competition is created between the ships manning the U. S. Ocean Stations by periodically promulgating Communications Summaries of Ocean Station Vessel operations containing information such as the following:

"The maximum average altitude for radiosonde observation was reached by the Cutter *McCulloch* on station ECHO with 20,775 meters. The *McCulloch* also secured the highest averages of maximum altitude on RAWINS with 10-AGE targets (18,245 meters); the longest average duration of tracking RAWINS with 10-AGE targets, (46.0 minutes) and the highest average of maximum radar slant range before target was lost (10-AGE) with 57,458 yards. The maximum radar slant range before target was lost, using 10-AGE targets was secured by the Cutter *Spencer* with 92,400 yards and also with the smaller balloons using wire targets with an average slant range of 29,204 yards and maximum slant range of 77,600 yards."

Captain Earl K. Rhodes, USCG, Chief, Communications Division, United States Coast Guard.

As it is the responsibility of the Coast Guard to deliver the meteorological observations to the appropriate U. S. Weather Central, and as these observations must arrive on time to be of any value, some appreciation of the necessity for rapid and reliable ship-shore communications circuits can be gained from the following schedule of observations and the Weather Bureau deadline for the receipt of same by the U. S. Weather Observer, Washington, D. C.:

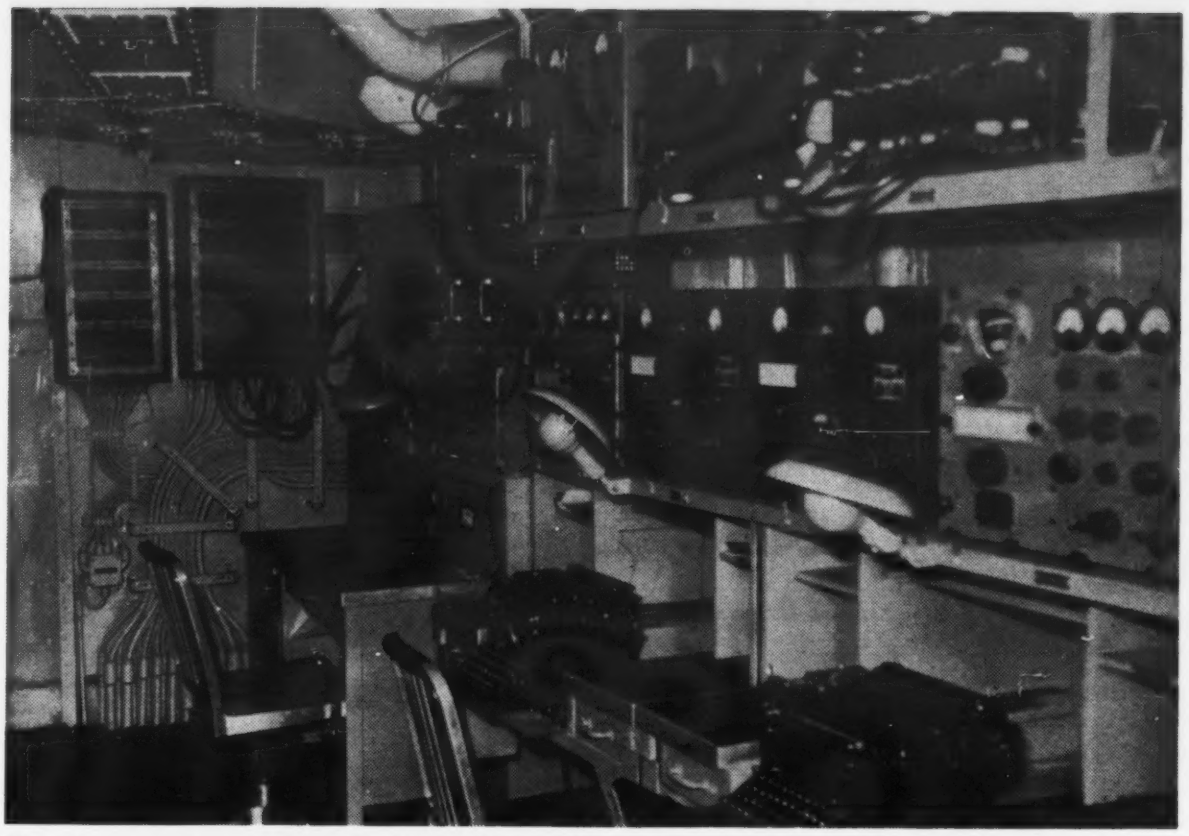
Time of Observation	*Type of Observation*	*Bureau Deadline*
0000	SURFACE	0033
0300	SURFACE	0333
0300	RAWIN (1st Section)	0413
0300	RAWIN (2nd Section)	0530
0300	RAOB (1st Section)	0550
0300	RAOB (2nd Section)	0640
0600	SURFACE	0633
0900	SURFACE	0933
0900	RAWIN (1st Section)	1013
0900	RAWIN 2nd Section)	1130
1200	SURFACE	1233
1500	SURFACE	1533
1500	RAWIN (1st Section)	1613
1500	RAWIN (2nd Section)	1730
1500	RAOB (1st Section)	1750
1500	RAOB (2nd Section)	1840
1800	SURFACE	1833
2100	SURFACE	2133
2100	RAWIN (1st Section)	2213
2100	RAWIN (2nd Section)	2330

Similar schedules, with identical times of observations must be met by the Pacific Ocean Station Vessels.

A Coast Guard Guardsman tracks a weather balloon with radar, on board an Ocean Station vessel. After radar has contact with the balloon, theodolite tracking is no longer necessary.

During the past year meteorological observations reached the appropriate Weather Central before deadline, ninety-four percent of the time from U. S. Atlantic Ocean Station Vessels, and ninety-six per cent of the time from U. S. Pacific Ocean Station Vessels.

Coast Guard Radio Washington, NMH, handles all traffic from the U. S. controlled Atlantic Ocean Station Vessels for the Weather Observer, Washington, D. C. Two families of frequencies (2 to 23 mcs.) are used for this purpose, with stations ALFA, BRAVO, CHARLIE assigned one series for simplex CW operation and stations DELTA, ECHO, and HOTEL the other. The latter series is also the primary Coast Guard long distance ship-shore series, consequently circuit discipline and procedures must be of a high order of efficiency to avoid unacceptable message delays. Except during ionospheric disturbances, each U. S. controlled Ocean Station Vessel in the Atlantic is in continuous contact with NMH. Frequency diversity reception is standard procedure on board the ships and at NMH, with NMH controlling the selection of frequencies to be used by the ships for transmitting the ship-shore traffic. As an additional aid to shipboard reception, signal splitters have proven extremely effective devices for improving the selectivity of the standard Navy receivers installed in all Coast Guard Ocean Station Vessels. As stations ALFA, and BRAVO lie in the auroral zone, high frequency "blackouts" at these stations are not uncommon. To cope with the problem of getting traffic through during ionospheric disturbances, U. S. Controlled Ocean Station Vessels losing contact with NMH transmit and receive traffic by medium frequency relay to a station vessel having contact with NMH. Meteorological traffic received at NMH is passed to the Weather Observer, Washington, via landline teletype.



The above picture shows radio operating positions in an Ocean Station vessel. Many pieces of equipment must be carefully placed in the small space of the ship.

In the Pacific, Ocean Station Vessels manning stations NAN, UNCLE, and QUEEN communicate with Coast Guard Radio, San Francisco, NMC, via a third family of ship-shore frequencies. Meteorological reports from these stations are addressed to the U. S. Weather Bureau Observer, San Francisco, and are relayed from NMC via landline teletype. Ocean Station Vessels manning stations SUGAR, and VICTOR transmit meteorological reports to Navy Radio Pearl Harbor via Navy ship-shore circuits. These reports are addressed to Fleet Weather Central Pearl Harbor, Weather Observer Tokyo, and Weather Observer San Francisco.

In addition to the scheduled reports furnished cognizant Weather Centrals, all U. S. Ocean Station Vessels furnish aircraft and ships, on a request basis, local weather information, via authorized ship-ship or air-ship circuits.

Navigational Aids

As all U. S. Ocean Stations are on the major trans-oceanic air routes, the Ocean Station Vessels serve a most useful function by providing navigational check points for aircraft navigators.

One of the primary aids to aerial navigation is the radio beacon operated by each Ocean Station Vessel when on station on a five minutes on, ten minutes silent schedule. Beacons are operated at other than scheduled times on request. The beacon employed on each U. S. Ocean Station Vessel and the antenna associated with the beacon, is designed to give a two hundred mile effective range for the beacon operating in the band 200 to 400 kcs. Normally the Ocean Station Vessels use modulated CW emission transmitting a signal identifying the station and the particular grid for the station in which the ship is located. The beacon transmitter can also be voice modulated. Although the beacons are operated primarily for the benefit of aircraft, it is known that merchant vessels are also using the beacon transmissions for navigational purposes, as there have been several occasions when Ocean Station Vessels have narrowly avoided colliding with merchant ships running down the beacon in low visibility conditions.

All aircraft passing within radar range of U. S. Ocean Station Vessels are tracked by radar to determine the course and speed over the ground of the aircraft. Attempts are made to identify and communicate with all passing aircraft.

On request, station vessels are prepared to and do furnish any or all of the following types of information to aircraft; Navigational position, magnetic course, speed over ground, local weather including winds aloft reports, and "Dog" values (corrections which must be applied to the indicated altitude in order to obtain the true elevation above sea level of the aircraft).

In order that aircraft may be furnished with accurate navigational fixes, it is first necessary that the Ocean Station Vessels be able to establish their own positions within tolerable limits of error. When it is impossible to obtain celestial observa-

Aboard an Ocean Station vessel, a civilian weather observer transfers onto a graph readings which are being received from a radiosonde high above the ship.

tions, a situation which occurs quite frequently on certain stations due to fog or inclement weather, LORAN is the primary tool for fixing the position of the U. S. Ocean Station Vessels.

In return for the information furnished passing aircraft, the Ocean Station Vessel requests complete flight data from the plane which is kept on visual file from first contact until one hour after its Expected Time of Arrival. The data is then filed in the permanent files of the vessel.

Trans-oceanic aircraft can communicate with U. S. Ocean Station Vessels via any of the following circuits guarded continuously in the Combat Information Centers of the Coast Guard Ocean Station Vessels: (a) A high frequency voice contact circuit; (b) A very high frequency voice calling and emergency circuit; (c) A very high frequency voice air-ship working frequency (available for use, but not guarded in Pacific Station Vessels). In addition, Coast Guard Ocean Station Vessels are prepared to communicate with aircraft on ultra-high frequency channels, or on appropriate international route CW or Voice frequencies.

Talkers on voice circuits, and radiomen on CW circuits have been trained and will use either International Civil Aviation Organization or combined military procedures depending upon the procedure chosen by the aircraft. In this connection the Coast Guard operates mobile trainers for refresher training of Ocean Station Vessels radio, Combat Information Center (C.I.C.), and bridge personnel. These trainers are capable of simulating any communications or electronics problem with which an Ocean Station Vessel may be confronted.

A boat crew from the U. S. Ocean Station Vessel, the USCGC BIBB, approaches the disabled BERMUDA SKY QUEEN which was forced down on the North Atlantic. Rescue missions such as this save many lives.

Search and Rescue

The secret of success in search and rescue operations lies in the field of communications. Without adequate, rapid and reliable communications lives which should have been saved will be lost.

The following communications arrangements are in effect in U. S. Ocean Station Vessels to fill the requirement for adequate communications for search and rescue purposes;

(a) All station vessels maintain a continuous guard on the international calling and distress frequency 500 kcs. Although this frequency is available for use by aircraft, safety, urgency and distress, messages on this channel are received principally from ships and survival equipment transmitters.

(b) All station vessels in the Pacific maintain a guard on the U. S. interim calling and safety frequency 8280 kcs. Ocean Station vessels in the Atlantic guard 8280 kcs. while enroute to and from station, but due to the additional Atlantic requirement that a guard be maintained on the appropriate route frequency, 8280 kcs. is not guarded while on station until information is received of a potential or actual distress. Although this frequency is also available to aircraft, safety, urgency and distress messages on this channel are received principally from ship and survival transmitters.

(c) While enroute to and from station and in U. S. Coastal waters, the Coast Guard calling and emergency frequency 2670 kcs. is guarded. At this time all U. S. commercial vessels equipped with 2 Mc Voice radiotelephones call for assistance on this channel when in distress. Commencing on 1 May 1953 all U. S. Ocean Station Vessels will additionally maintain a continuous guard on the International calling and distress radiotelephone frequency 2182 kcs., which comes into force internationally on that date.

(d) All station vessels maintain a continuous guard on the very high frequency aeronautical calling and emergency frequency 121.5 mcs and on request guard the U. S. military ultra-high frequency calling and emergency frequency.

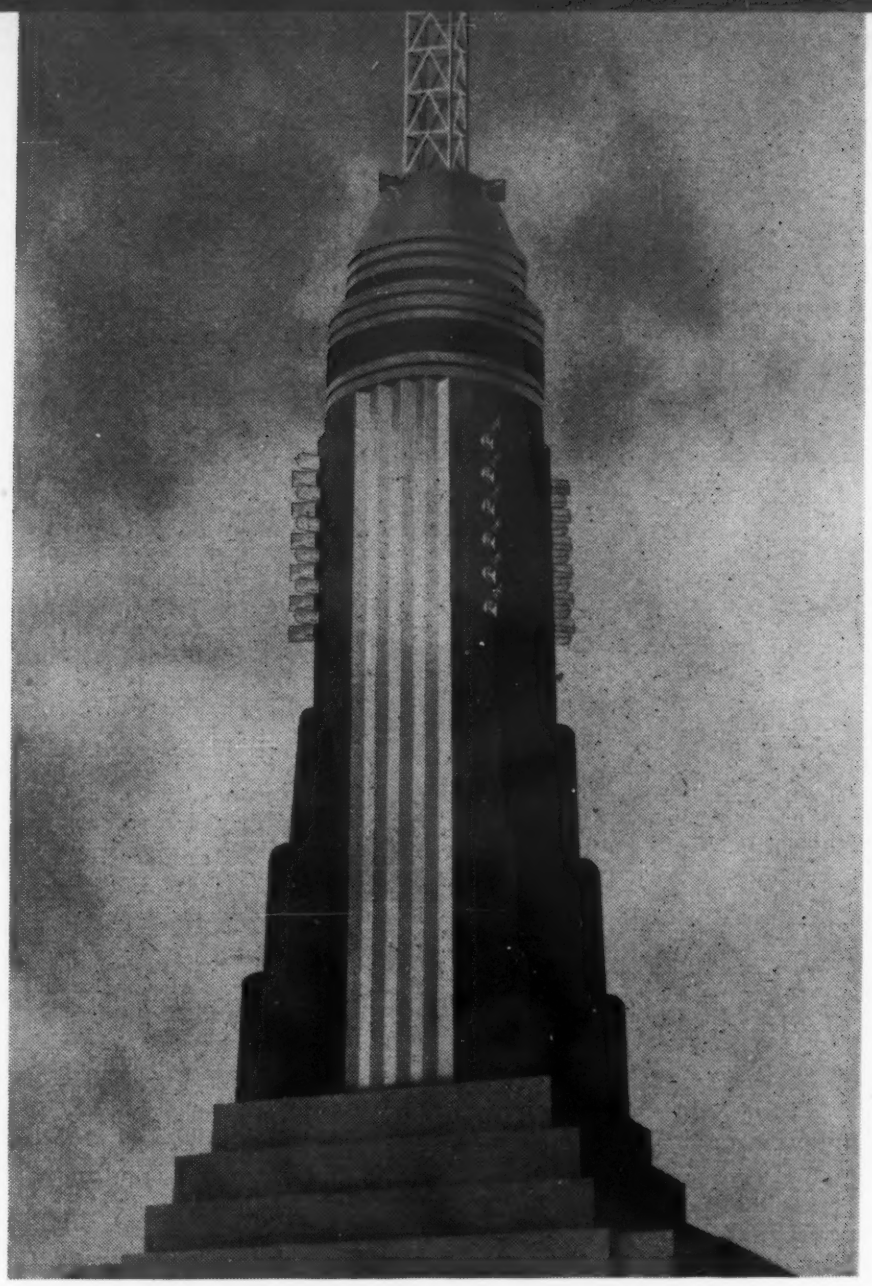
(e) Each station vessel maintains a continuous guard on a prescribed voice high frequency for air/ship communications with transoceanic aircraft.

(f) Each Ocean Station Vessel in the Atlantic continuously guards an appropriate CW route frequency and is in continuous contact with the Overseas Foreign Aeronautical Communication Service (OFACS) aeronautical station controlling the circuit. As aircraft in distress and having contact with an aeronautical ground station usually use the established air/ground circuit for making known their distress, the route frequency guard enables the Ocean Station Vessel to intercept distress messages directly from aircraft unless the aircraft is on a different route frequency, in which case information pertaining to the distress is passed directly to the appropriate Ocean Station Vessel by the OFACS aeronautical station.

(g) As the voice contact frequency for stations NAN, OBOE and UNCLE is also an OFACS route frequency, guarded by KFM, Honolulu and KSF, San Francisco, the situation with respect to route frequency guards is somewhat similar to that in the Atlantic Ocean Station Vessels, except the route frequency guard can be maintained in the C.I.C. instead of in the radioroom of the station vessels.

(h) Stations SUGAR and VICTOR in the Pacific normally maintain a loudspeaker watch in the C.I.C. on the appropriate Aeronautical Radio Incorporated air-ground voice frequencies controlled by aeronautical stations at Anchorage, Shemya, and Tokyo for civil airline coverage purposes, as well as a loudspeaker watch in the radioroom on the appropriate AACS controlled frequency for military aircraft.

(*Continued on page 74, col. 1*)



Artist's drawing of the upper portion of the Empire State Building, showing Andrew Skew Antenna on conical portion of tower and proposed 48 element Skew Antenna for TV Channel 13 mounted on the corners of the tower.

by

C. Russell Cox,

Vice President,

Andrew

Corporation

ANDREW

Transmission Lines • Antenna Equipment

Sixteen years ago it took a lot of courage to confine the activities of a newly formed business enterprise, employing only the proprietor and a part-time schoolboy, to the narrowly specialized field of radio antenna equipment. That the Company's subsequent growth record proved the decision to be as sound as it was courageous is just one more indication of the benefit derived from the founder's strong emphasis on long range planning.

It was long range planning which, in late 1936, encouraged Dr. Victor J. Andrew—engineer, physicist, and inventor—to hang up his shingle in the basement of a rented bungalow near Chicago's Midway Airport. Dissatisfied with various jobs he had held since receiving his Ph.D. at the University of Chicago, in the depression year of 1932, he resolved to establish a manufacturing and consulting engineering service in a field which seemed to combine his two major areas of interest — engineering and physics. So it was that Victor J. Andrew Company, predecessor of the present ANDREW Corporation, was born, specializing in antennas, air-dielectric coaxial cables, antenna tuning equipment, and other components relating to antenna systems generally.

Business was far from booming during the late thirties, and in those early days it was often a question which should be the occasion for the greatest rejoicing—the arrival of a hundred dollar order, or the receipt of the customer's check to pay for it. However, with the outbreak of war in Europe, sales volume advanced, and in December, 1941, one week before Pearl Harbor, the operation was moved into a 12,000 square foot garage building at 363 East 75th Street, where the main offices are still located. During the war years emphasis was on the production of large air-dielectric coaxial cables, which were

produced in volume for military applications in radio and radar. Air Force personnel will particularly remember the ANDREW MK-20/UP dry air pump, a hand operated air pump containing a chemical desiccant, used extensively for pressurizing airborne radar equipment, notably the APS/4.

Physical Facilities

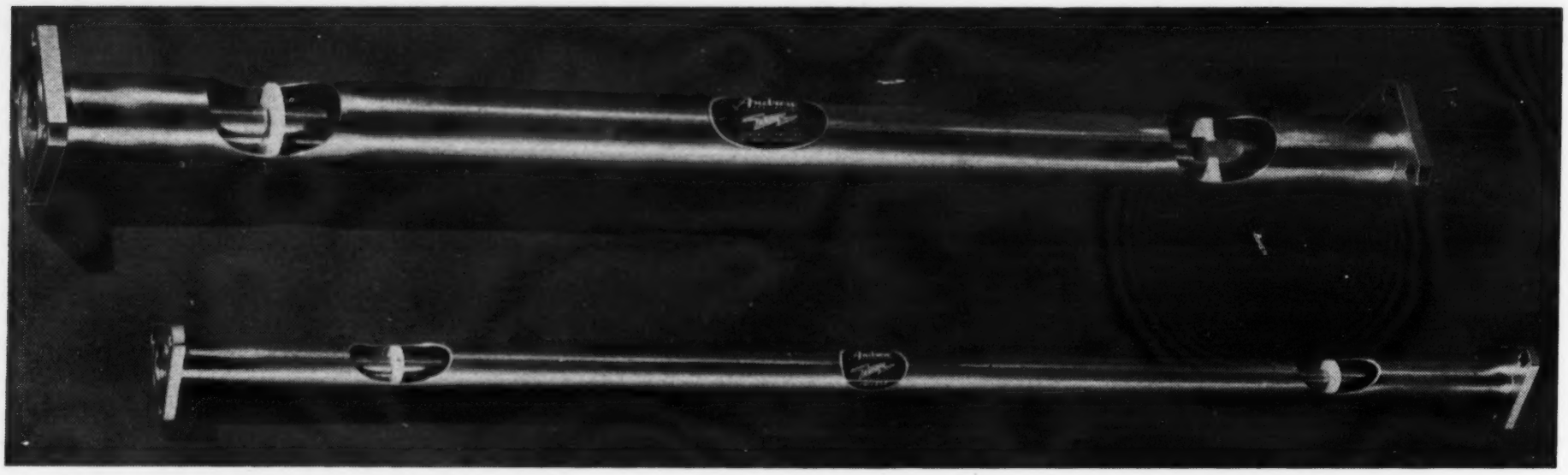
The Company's physical facilities today present a marked contrast to those of sixteen years ago. Manufacturing is conducted in two Chicago plants, totalling 31,000 square feet of floor area, and equipped with a variety of metal working tools required for the production of antennas and coaxial transmission lines. A particular source of pride to ANDREW Corporation's engineering-minded Management is its antenna development laboratory, located on a 430 acre farm site at Orland Park, Illinois, 23 miles southwest of downtown Chicago. Here the visitor will find an antenna man's paradise, with large wooden buildings, testing platforms of various sizes, all made of timber, a wooden mock-up of the Empire State Building, a 100 foot steel tower, and test equipment in abundance. To the north of the laboratory area a site has been staked out, on which construction of a new manufacturing plant will soon be started. As in all other phases of its growth, elaborate long range plans have been formulated for the expansion of manufacturing activities at Orland Park, and the architectural drawings for the buildings that will be required for the expanded operation contemplated for 1960 have all been laid out.

Engineering is the keynote of operations at ANDREW Corporation. Probably very few other companies of similar size and scope spend as large a portion of the sales dollar on engineering development, technical assistance to customers, and technical service for the benefit of the electronics industry as a whole. Ample evidence of this policy is seen in the large number of engineering articles contributed to the technical press, the number of technical papers presented at gatherings of engineers, the number of man-hours devoted to formulation of engineering standards on RTMA standardization committees—all statistics that would do credit to an organization much larger than ANDREW Corporation. While this emphasis on engineering has sometimes resulted in a squeeze on profits, there is a strong indication in the rapidly growing backlog of orders that the investment is paying off.

In planning its product line, the Company adheres to its original policy of specialization in antenna equipment and coaxial cables. However, in recent years, the trend has been to devote increasing attention to the expanding market for antennas. As a result, any observant person who spends a few hours driving along the nation's highways is almost certain to see one or more of the Company's antennas, mounted on a pole, tower, or building, giving faithful performance in the vehicular communications, FM broadcasting, or microwave relay services. To one unfamiliar with the complexities of the art, the Company's current antenna catalog presents an amazing variety of devices for launching a radio wave into space. There are simple zero-gain antennas with circular, carioid, and "Figure 8" patterns; there are Yagis, corner-reflectors, parabolic reflectors, colinear arrays with as many as 16 fed elements, and rhombics; and there are antennas for hurricane conditions, for high power, and for a variety of frequency bands. What the catalog does not reveal, however, is the Corporation's strategic position as a supplier of special purpose antennas for military applications. In this field, ANDREW has developed antennas ranging in frequency from 15 KC to 32,000 MC, and in complexity from a minuscule dipole—which is not as simple as it looks—to a complex multi-element array, too large to ship on a freight car.

Commercial Expansion

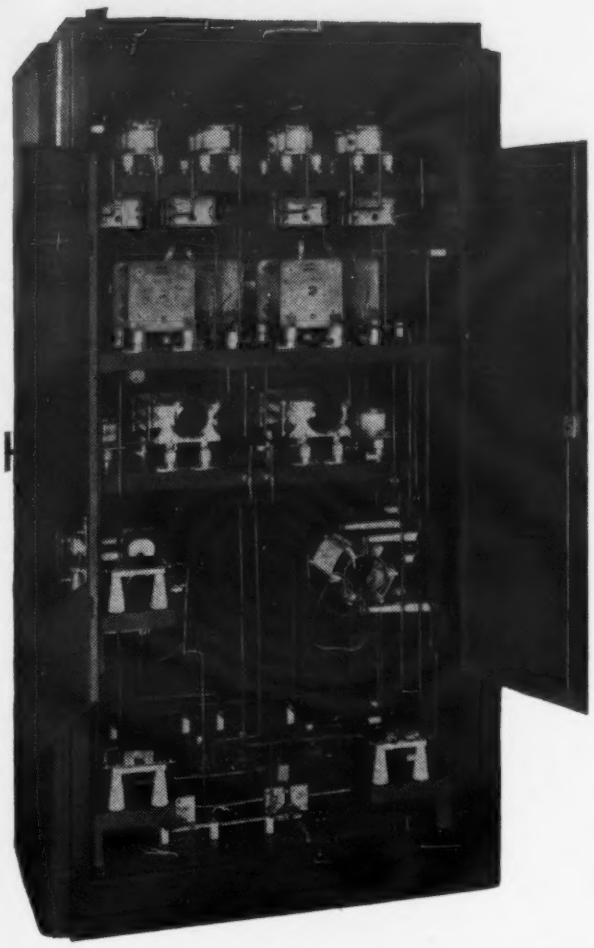
In the commercial field, ANDREW has several promising new ideas up its corporate sleeve. One is the "skew" antenna, a scheme for disposing a number of radiating elements around a supporting structure whose dimensions are very large compared to a wavelength, while still producing an omni-directional radiation pattern. A contract to apply this principle to a Channel 13 TV antenna mounted on the Empire State Building is already well under way. Another is an extremely broadband radiating element, adaptable to a wide variety of antenna problems in which bandwidth is an important consideration. Coaxial cables have not been neglected in the Company's development program. Technical details of a new continuously produced, semi-flexible coaxial cable, to be manufactured in diameters up to $3\frac{1}{8}$ inches, will soon be announced.



Rigid coaxial transmission lines manufactured by the Andrew Corporation for use in microwave radio relay systems.

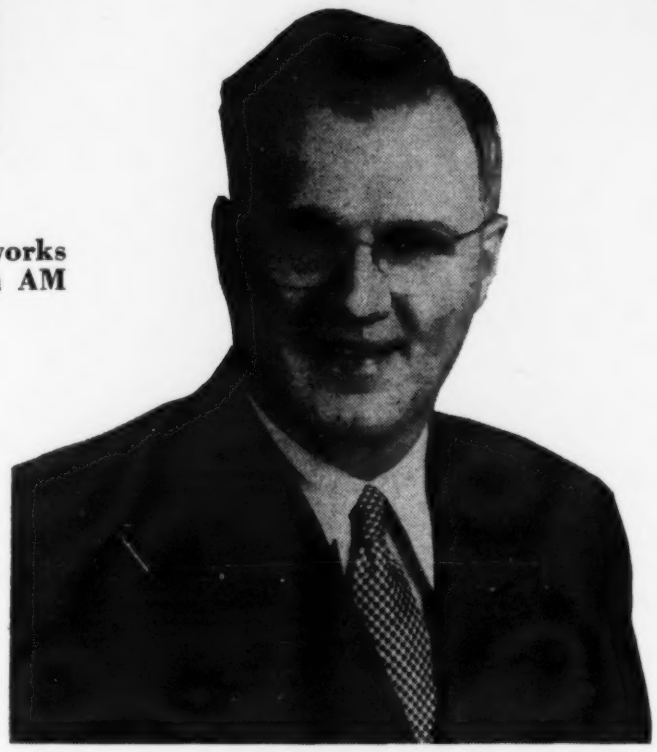
Long Range Planning

The management of ANDREW Corporation spends much time peering into the crystal ball, attempting to forecast the direction in which the expanding field of electronics will evolve. What it sees is the ongoing growth of the antenna-using services, notably vehicular communications and mircrowave relay, to a level far beyond anything heretofore envisioned. Around this vision ANDREW's engineers, and its scientists-turned-businessmen, are building their Long Range Plans.

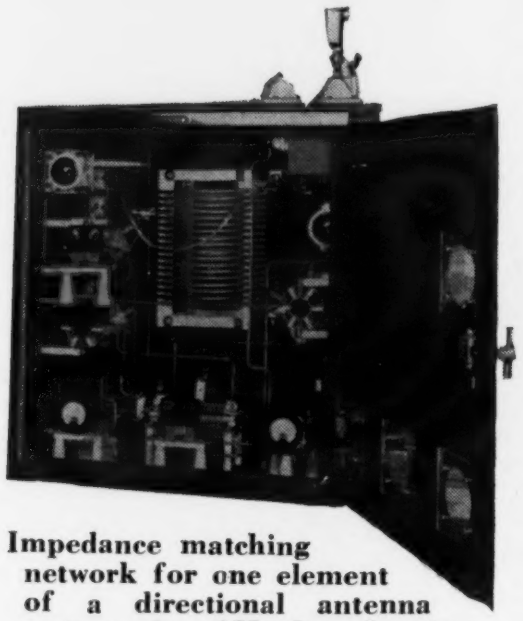


Phasing and power dividing networks for directional antenna system in AM broadcasting service.

Production of 3⅛" diameter coaxial transmissions lines.

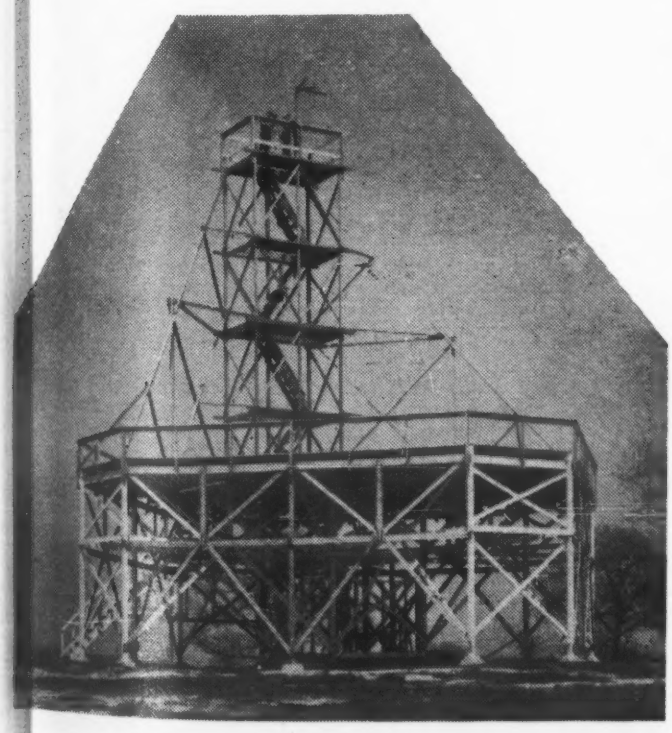


Dr. Victor J. Andrew
Chairman of the Board, ANDREW Corp.



Impedance matching network for one element of a directional antenna system in AM broadcasting service.

Antenna testing platform at ANDREW development laboratory in Orland Park, Illinois.



Assembly operations on six foot parabolic reflector antennas for 2000 mc radio relay service.

Magnetic Amplifiers for Electronic Uses

by Charles DeVore

Naval Research Laboratory

INHERENT high gain, speed of response (less than one cycle), independence of power voltage and frequency, wide output range and relative independence of specific core materials are characteristics of new magnetic amplifier circuits developed by the Naval Resarch Laboratory which open a promising field for application of these devices to a variety of military and industrial applications where reliability and maintenance-free operation are essential requirements.

While they will not do away with the electron tube, they appear useful replacements in a number of electronic devices, including the increasingly important ones of digital computers, telemetering, and remote control. Comparison with the transistor, while a natural one, is not a fair one; unlike transistors, magnetic amplifiers are not low-power devices. Another point in their favor is that they are not subject to the temperature limitations of the more recent development.

More recent development? Yes, magnetic amplifiers are not new. E. F. W. Alexanderson, at General Electric Company, was granted the basic patent for magnetic amplifiers in 1915. He developed it as a device for modulating high-frequency a-c from one of his alternators for use in trans-Atlantic radio telephony. It is interesting to note, incidentally, that by 1916, magnetic amplifiers had been used to modulate as much as 72 kw, while Dr. de Forest's triode, invented in 1907, had been developed to handle only a few watts.

But the popularity of, and technical advances in electron tubes pushed the magnetic amplifier in the background, with the notable exceptions of Germany and Japan.

Development of better magnetic materials and of crystal and selenium rectifiers revived interest in them in this country, particularly aboard ship, where their characteristics of ruggedness, freedom from the mechanical limitations of electron tubes, the fact that they required no warm-up time, made them desirable for ship propulsion and steering systems, servocontrol mechanisms, voltage regulators and similar applications where slowness of response was not a major detriment.

Less than three years ago, Dr. R. A. Ramey, of the Electricity Division of the Naval Research Laboratory, developed a new approach to the theory of magnetic amplifier operation. He argued that the magnetic amplifier is a voltage-sensitive device, rather than a current-sensitive one, as generally believed.

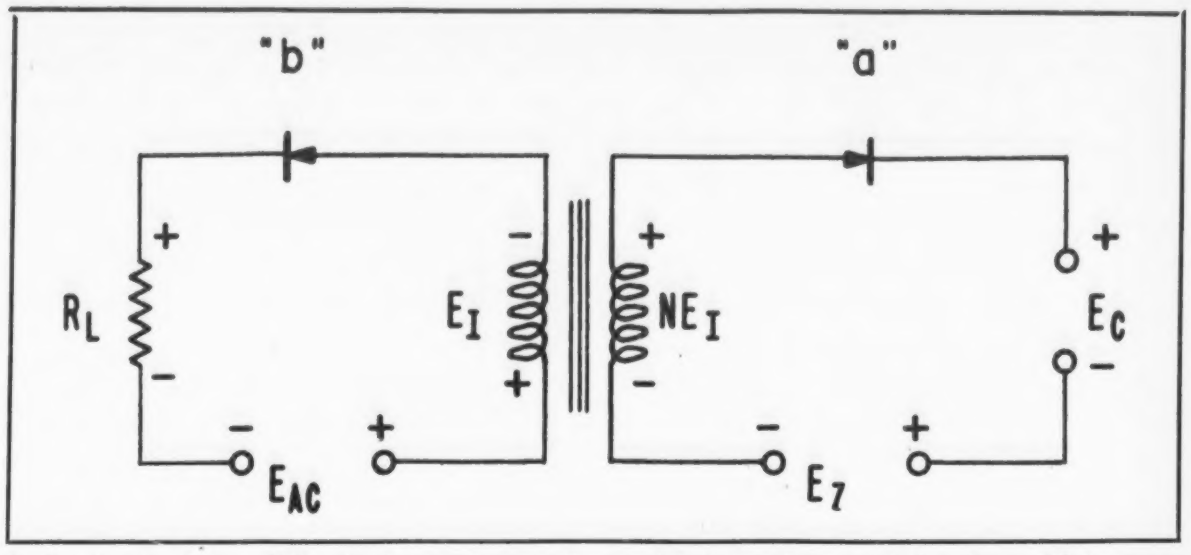
Essentially, the magnetic amplifier consists of a transformer in whose primary or output circuit there is an energizing a-c source in series with a load circuit resistance. The secondary or control circuit has the transformer secondary connected in series with a control circuit resistance and a control voltage source.

During one period of time, the transformer core is allowed to saturate and allow output current to flow. During a succeeding period, its core is caused to desaturate or reset by an amount that depends primarily on the control circuit functions or parameters. Assuming resistive loading in the output circuit, these periods can be easily visualized. During one-half cycle, saturation occurs; during the next half-cycle, controlled reset occurs.

By a mathematical analysis of this basic circuit, Dr. Ramey concluded that the control voltage is the only

independent variable, that it need only supply considerably reduced power for the amplifier control, and that the control energy in the amplifier core in steady-state operation can be supplied largely from the a-c power source.

He then proceeded to test his theory with experimental circuits. He evolved, finally, a parallel, magnetic amplifier with a response time less than one cycle, coupled with high "gain," good linearity, wide output range, virtual independence of supply voltage and good output power-to-weight ratios. In this circuit, two single-core amplifiers were paralleled to give full-wave rectified output. In each single-core amplifier, the a-c supply voltage is applied to a winding only during positive half-cycles; during negative half-cycles a rectifier blocks the a-c voltage from the winding. In the secondary or control circuit, a second rectifier is placed in series opposition to the control voltage (to block the control voltage circuit during periods of conduction) which is in series with a magnetizing voltage. During positive half-cycles, this magnetizing voltage must prevent flow in the control circuit caused by voltage transformed from the primary circuit and during negative half-cycles it must accomplish the appropriate magnetization of the core. Hence this voltage can be the a-c supply voltage multiplied by the turns ratio.



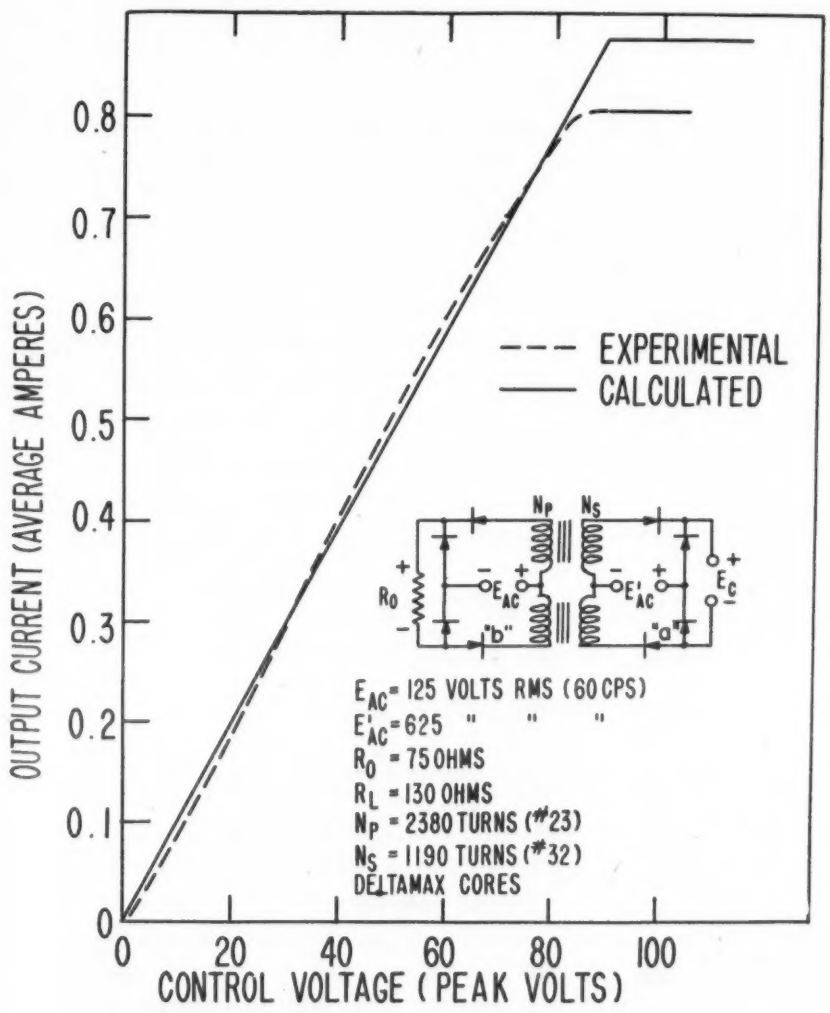
Basic circuit of new NRL single-core magnetic amplifier, involves control voltage (E_c), magnetizing voltage (E_z), a-c supply voltage (E_{ac}) and load element (shown as a resistance here). Rectifiers allow transformer to conduct only during alternate half-cycles and to be magnetized during the other half-cycles.

It is difficult to compare the "gain" of the new NRL developed magnetic amplifiers under the conventional definition of "gain"—ratio of powers in the output and input circuits. In the case of the NRL amplifier, the input power can be zero under certain conditions, which indicate an infinite "gain." On a comparable basis, however, Dr. Ramey and his associates found that "gains" of more than a thousand could be obtained at 60 cycles per second (with 100 percent response within a cycle) using materials now commercially available and without compensating for control current. With care in selection of core materials and rectifiers, they estimate that "gains" of the order of 10,000 at 60 cycles per second are possible with appropriate circuitry. The response time will remain less than one cycle. This performance compares with today's commercially available magnetic amplifiers which, with similar response characteristics, show power gains in the range of 20 to 50! Operation at higher frequencies should give increasingly better performances.

Next, they turned their attention to the consideration of the control circuits for magnetic amplifiers, in an effort to broaden the understanding of the operation of such devices. These studies included linear methods, such as a resistance, and nonlinear methods, such as a rectifier, a rectifier combination, or a reactor combination. Thyraton and triode control were of particular interest.

Again, it was found that control circuit current, rather than being related directly to the output current is more directly affected by such factors as rectifier leakage, core loop characteristics, and the type of parameter used in the control element. Also, again it was proved experimentally that the response time of a magnetic amplifier circuit will stay under one cycle so long as no delay is introduced in the control element.

How about the effect of core materials on magnetic amplifier circuits? Well, Leo J. Johnson, also of NRL's Electricity Division, looked into this question. He found that a core with a wider, more nearly rectangular hysteresis loop more nearly approaches the ideal since it permits greater rectifier leakage without loss of linearity and also provides high residual induction. But, again, recti-



Transfer characteristic of NRL parallel magnetic amplifier shows linearity of response. With control voltage set to give one-fourth maximum output current, line voltage was reduced to 50 percent of nominal value with less than 10 percent change in output average current.

fier leakage was the problem; leakage which exceeded half the width of the hysteresis loop resulted in uncontrolled reset for the circuit, with a consequent reduction in power handling capacity. Given rectifiers with less leakage, however, it is desirable to use cores with narrower hysteresis loops since these have an inherently high gain factor. He arrived at this guide to circuit design: Since the control-circuit is equal to the magnetizing current minus the load-circuit rectifier leakage current times the turns ratio, the only requirement for selecting an appropriate rectifier to obtain an optimum transfer characteristic is that the leakage must never exceed the magnetizing current requirement.

The characteristics of reliability and maintenance-free operation logically suggest them for application to digital computers, where electron tube failure today is a major headache. Speed of response is also required, however, since this determines computing speed. Power gain is an additional requirement, because in a given computer these devices must be cascaded so that one device operates others as well as associated registering or indicating devices.

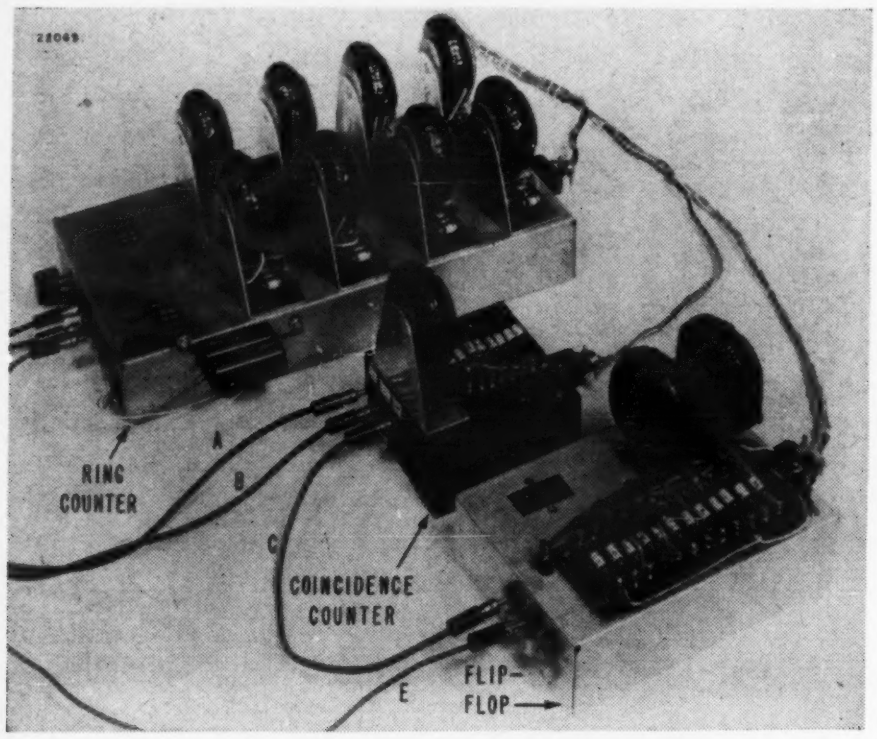
So Dr. Ramey and his group applied their newly developed single-core amplifiers to this problem, again on an experimental basis. Again, they were successful; the circuits evolved responded to information presented at twice the frequency of the carrier signal. A coincidence counter was constructed, using the basic circuit with the addition of several parallel input circuits. Cascading of similar circuits produces a magnetic ring counter and a two-stage flip-flop into which circulating pulses can be wed or "programmed." For programming the ring counter, an "OR" circuit was developed which allows either of two signal sources to actuate the programming stage.*

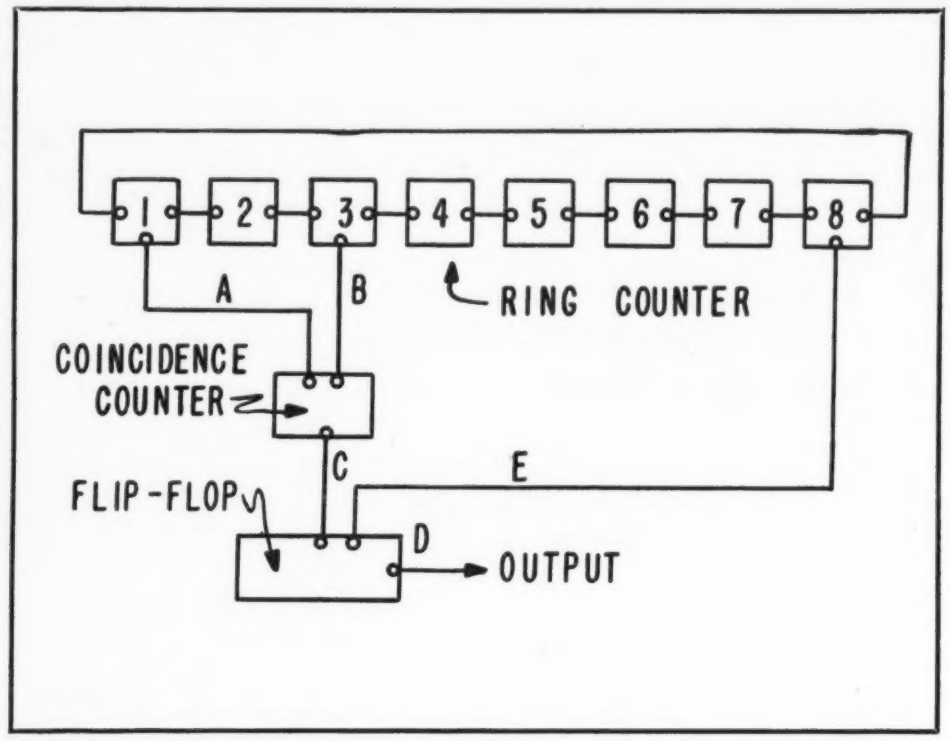
What about other applications? Computer-type circuit configurations have interesting possibilities in a variety of fields ranging from telemetering and remote control to calculating machines.**

The flip-flop can be arranged to indicate and repeat the magnitude of pulses which only partially block its reset and can thereby be used for pulse stretching. In remote control systems the flip-flop can provide power for motors, indicators, etc.

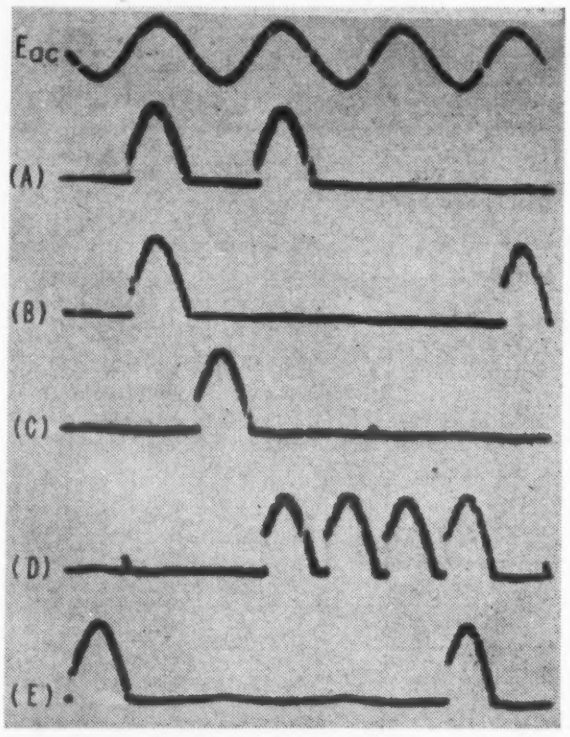
The ring counter can be used as essentially a magnetic rotating switch for the other magnetic elements in telemetering and remote control applications.

While the experimental work at NRL has not yet confirmed it, there is evidence that operation of these circuits with megacycle repetition rates is possible with materials available today. Based on the laboratory's successful work to date at power frequency ranges, no fundamental difficulties in the magnetic amplifier circuitry are foreseen at the higher frequencies provided an adequate power source of high frequency energy can be attained. Practical difficulties are predicted at high frequencies if relatively poor materials and components are used. For example, unless low-loss cores are used, the magnetization currents could be so high that very little gain could be expected or core heating could become a problem.





Experimental setup of magnetic amplifiers as computer elements. Coincidence of pulses in lines A and B is noted by an output pulse in line C which triggers the flip-flop whose output appears in line D. Flip-flop is triggered off by any pulse in line E. Supply voltage (E_{ac}) shown as time reference. Below is an oscillograph reading showing operation of circuits using magnetic amplifiers.



*From a design standpoint, it is interesting to note that in one complete system, a single type of rectifier and core size could be used and the winding of all cores, regardless of the element into which they are placed, could be identical.

**Since the output of the coincidence counter is proportional to the lowest signal voltage path for reset current, it provides an interesting sampling circuit. With one input source monitoring a quantity whose measurement is desired and its other inputs or input pulsed periodically with a blocking pulse, the output of the coincidence counter will be proportional to the quantity being measured. This output may also take the form of pulse-width or pulse-time modulation.

DOING IT THE HARD WAY

by

Arthur K. Ransom
Lt. Col., Signal Corps

This is the last quiz of Colonel Ransom's informative series pertaining to radio and wireless equipment — the forefathers of today's communications system.

Last time SIGNAL rolled off the press it carried a description of the "FERRO-MANGLING DETECTOR" which quite a few of you old-timers spotted as an invention attributed to Marconi and most efficiently used in conjunction with the Senatore's "multiple tuner." Some of you noted a resemblance between the magnetic detector and to-day's magnetic recorders.

In this connection it is interesting to recall that prior to World War I, the "Telegraphone" of Herr Poulson—a magnetic-type of recorder—was in use. This device was employed to record high-speed transmissions for subsequent transcription manually at lower speeds. To the old telegraphone add an amplifier, increased fidelity, and a wider frequency response, and the thing would look quite familiar in 1953. Perhaps there is, truly, nothing under the sun.

And that has been one reason for presenting this series over the past year. Always the pendulum swings back. Occasionally, a long-forgotten fact is recalled, dusted off ,refurbished and introduced as a revolutionary development—earth-shaking in its implications. Just as atomic fission is based upon formulae a half-century old, so did the "G-string" evolve from mathematical philosophy propounded nearly four score years ago.

Now the pendulum swings again. In the last quarter century we have completely forsaken the low frequencies which so loyally carried the burden of our art in the days when it was a-borning. In recent years their utilization, research on their equipment, and even awareness of their prior employment, were all but forgotten. Spark and arc transmitters were first to fall before the vacuum tube onslaught. The bulky alternators resisted longer. But they, too, have gone the way. Where? Few cared enough to inquire.

Then came Jim Creek—1,000 kilowatt Navy station—to operate on frequencies barely above audibility. A magnificent thing with twin mountain ranges to support its antenna; an awesome field strength that demanded new concrete reinforcing techniques; a mighty output which no existing lead-thru insulator could hold. Think with what pride—nay, in what awe—might an operator touch the key that commands this masterpiece, knowing full well that the puny strength of his finger is unleashing 1,800 kilowatts of plate power. "An enterprise for a dream, O my Masters."

At about the same time we began to hear about the "polar concept." Old, familiar maps were torn from walls—replaced by wierd things with white, central areas, surrounded by blue tints and strangely-shaped land masses. Encircling all was the Equator. News magazines wrote knowingly of "Operation Musk Ox," "Operation Frigid," and other exercises similarly lightly-veiled. New Army Field Manuals featured "Arctic Warfare," "Extreme Cold" and other equally unpleasant phrases in their titles.

Military communications experts began to fume about "magnetic effects," the "aurora borealis" and other high-sounding obstacles to their work.

Progress was on the march once more. Low frequencies were discovered! They were far less allergic to auroral and polar interference. They were the panacea of the frozen poles! From the sacred secret precints of great laboratories came vague rumors; strange new words. Through them all—like the beat of jungle drums—ran ". . . low frequency . . . low frequency . . . low frequency. . .". From "sources usually considered reliable" and "persons with unimpeachable information" it was learned (and reported by knowing writers) that the "military" was interested in low frequencies. This interest waxed in to "exploration of possibilities" and finally blossomed into a shameless admission that research and development were questing forth into the barren domain of low frequencies—void as interstellar space.

The pendulum has swung once more. All of which has brought great joy to your Scribe. It has kindled anew in him the flame of a crusade. He sees himself a prophet pointing the way through the darkness; holding high the torch of knowledge in one hand whilst clutching the past year's issues of "SIGNAL" in the other.

In those hallowed pages lies the answer. Only failure to discover it has stayed Aggressor from a transpolar thrust at the industrial heart of our great Nation.

And now—are you listening? We have developed the vacuum tube into a generator of fantastically high frequencies—and the end is not yet in sight. In this realm "the little bottle with nothing in it" is sovereign. Now we require a generator to function at the other end of the spectrum. Is the "little bottle" what we seek? Is it an elixir? Is it the philosopher's stone? Is it the best low frequency generator we can produce? Or is it the only one to-day's engineers ever knew?

Must new things resemble the not-so-new things they replace? Does a helicopter resemble a bird? Or a rocket? Or a blimp? All four traverse the same medium. Must those portions of the spectrum sacred to Goldschmidt, Fessenden, Alexanderson, Poulsen and their fellow immortals be desecrated by the vapid, insidious "bottle"? Let us say "NO" with a thunder that will rattle the very mountains of Jim Creek. Let us not set a boy upon a man's work.

Let us choose well the pieces with which we build. Nothing less than the canvas of a Rembrandt, enhanced with a gilded frame from the *atelier* of a da Vinci, set upon an alabaster pedestal such as Rodin might have shaped! Thus will we build the true Arctic wireless (t'ell with radio) transmitter.

Here are the ingredients:—

1) A Goldschmidt Alternator (SIGNAL, Nov.-Dec. 52)

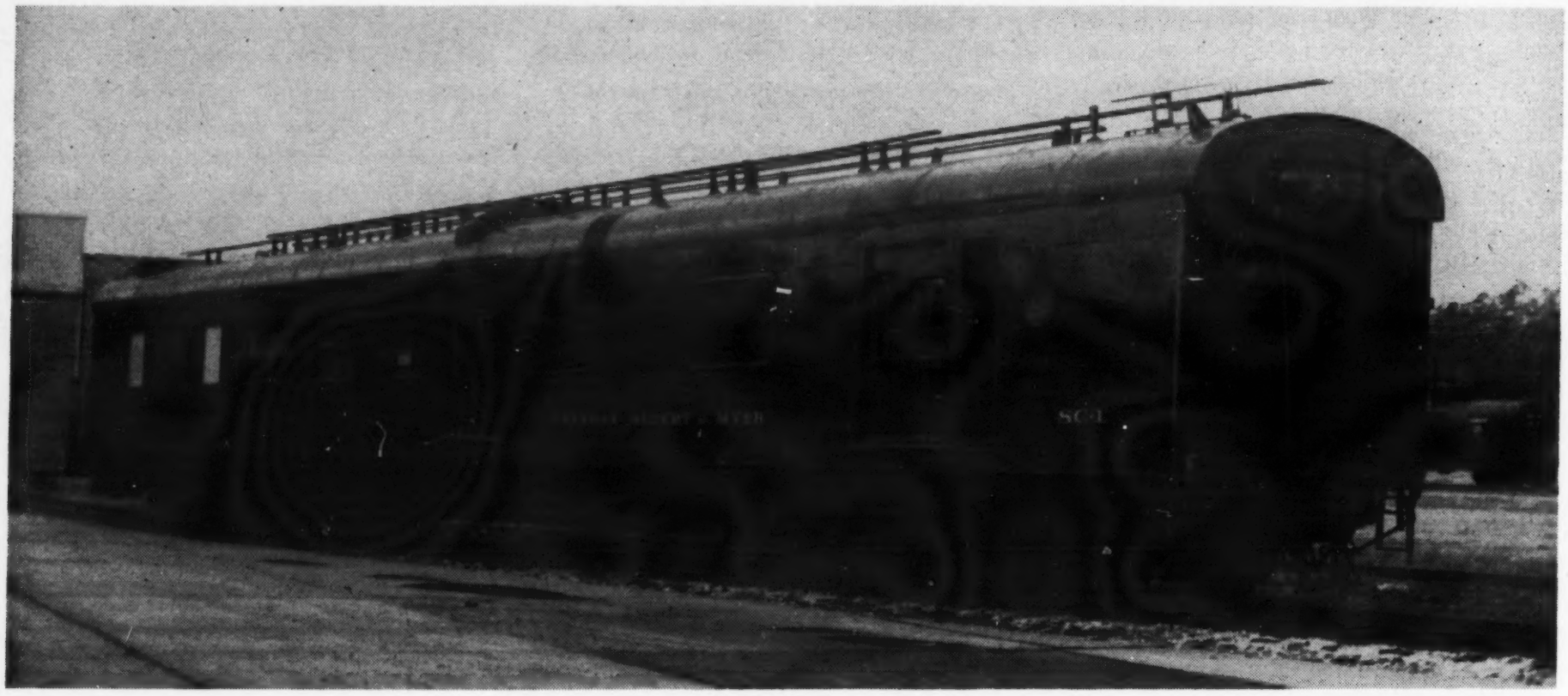
2) A Joly-Arco frequency multiplier (SIGNAL, Sept.-Oct. 52)

And, Brother, that's all there is to it. I fail to see why these engineers are complicating the matter with all their involved circuitry. Consider the simplicity of my proposal! Through a torque converter the alternator's basic

(*Continued on page 76, col. 3*)

WTE calling

The Story of the President's Communications Car



by Major George J. McNally

Commanding Officer,

White House Signal Detachment No. 2

Necessity may have been the mother of invention but the latter, in turn, has many outstanding progeny, not the least distinguished being Communications. At times a fair and smiling child, it often seems a hydra-headed monster, defying our best efforts at sociability and understanding. Some of the most inquisitive and many of the most frustrated men in the world have long been devoted subjects of the electronic master.

As an example of some of the knotty problems that have faced the United States Army Signal Corps in the past, let's consider the technical and physical aspects of providing mobile communications to the President of the United States. Here is a man to whom all pertinent intelligence must be readily available. His commands must be guarded until he wishes them known in order that he may most effectively fulfill his mission as President and Commander-in-Chief of the Armed Forces.

World War II had begun for this country on the afternoon of December 7, 1941 and a small group of Signal Corps personnel headed by Colonel William A. Beasley was in the process of determining the types and means of communications necessary for the President.

Among the major problems was that of mobile intelligence for a travelling man—for President Roosevelt. He moved largely by train and auto, sometimes by ship and occasionally by airplane. That was the problem in the lap of those who boasted: "The difficult we do immediately, the impossible takes slightly longer."

Portable mobile radio was well understood, so it was relatively simple to satisfy the needs of the U. S. Secret Service with voice modulation equipment in the automobiles they used in guarding the President's road travel. When he took a train, however, it was something else again.

You can't tear up a President's private car for experiments so the next best thing is to get your own. This was done and a thing of wonder it was. A combination (half box car, half coach) was obtained and the trial and error method was off to a flying start.

First, a five kilowatt gas engine in the baggage compartment and a BC-610, 250 watt transmitter to keep it company. Out came a couple of coach seats and a pair of receivers were shock-mounted on the bulkhead with a neat shelf underneath on which to mount the C. W. key and a Mill. Something missing? Of course, the er — water cooler. Something else? Darn it all, no antennas! Oh yes and a call sign. *WTE* was assigned.

At about this point, the American Association of Railroads reared its collective head and announced in stentorian tones:

"Thou shalt go no higher than 13 feet 6 inches above the rails, else all above be left outside the first tunnel thee enter."

Who ever heard of an antenna six inches off a metal roof? Why the

White House Signal Detachment. That's where the sky (?) wire wound up. A nice long (80 odd feet) wire, the length of the car against the ground of the car itself. Noisy? Yes. Inefficient? Oh, yes. Unsatisfactory? Definitely. Signals? Oddly, enough, yes again.

So they rolled, with a squeaking signal, up and down and across the nation's railroads. The Detachment was a great trial to, and tribulation to, the rest of the Corps.

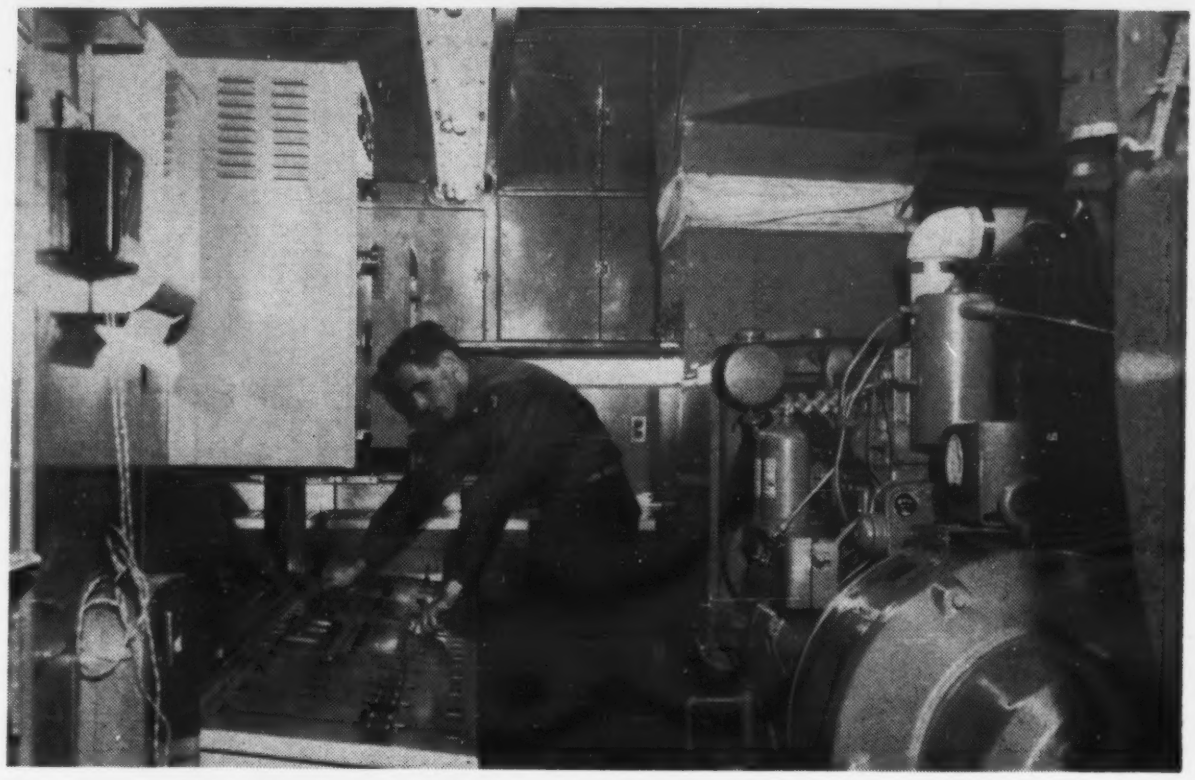
Up to now all that had been proven was that in spite of assorted obstacles, C. W. signals could be sent from and received by a somewhat ancient coach-baggage railroad car travelling on a Presidential train.

While the Signal Corps, eyeing proudly a minor accomplishment, was laying long range plans, Fate again stepped in to force the issue. Oddly enough, again it took the form of Railroad People.

"Never mind trying various gas engines for stability," the voice decreed. "Get rid of them for they are dirty, smelling things and a fire hazard, which we will not haul further."

In went a Diesel engine of 15-kilowatts. Since that sort of unbalanced things, it was followed by a one kilowatt transmitter. Now things really began to happen.

Several short trips had shown that receivers, shock mounted, had a vicious habit of vibrating in synchronization with the car when certain periods of vibration were reached. A few moments of such oscillation and the radio operator had the receiver in his lap. They were promptly bolted down. While the 610 transmitter (Bless Hallicrafter for this one) did nicely, the first "Big Tom" transmitter promptly shook itself to pieces. Also by this time there was an assortment of wires of various length strung along the roof. Feeder problems arose. Doublets were the order of the day and they worked after a fashion. It was easy enough to tell they were working because the neon tubes everyone carried lit up nicely when they went into the transmitter (baggage) end of the car.



The power room of the new mobile communications train equipped by the Signal Corps is shown above.

Enter the menace again. The Railroad People, who must spend a great deal of time in research, came around again, expressed horror at the changes in their beloved rolling stock and announced that the antennas would have to come down. Getting the reaction they apparently anticipated they gave the alternative (in accordance with an old dusty Mss. found in their files) that all exposed aerials be housed in a wooden trough!

This problem was surmounted by designing and installing an elaborate system of tubes, elbows and unions of Poly tubing. The antennas were fitted in and off went the train again. Congratulations were abruptly ended not long after by the inquiry of a section hand, who wanted to know what the neon sign on the roof said. To the Signal Corps the sign spelled "Fire" from arc-overs!

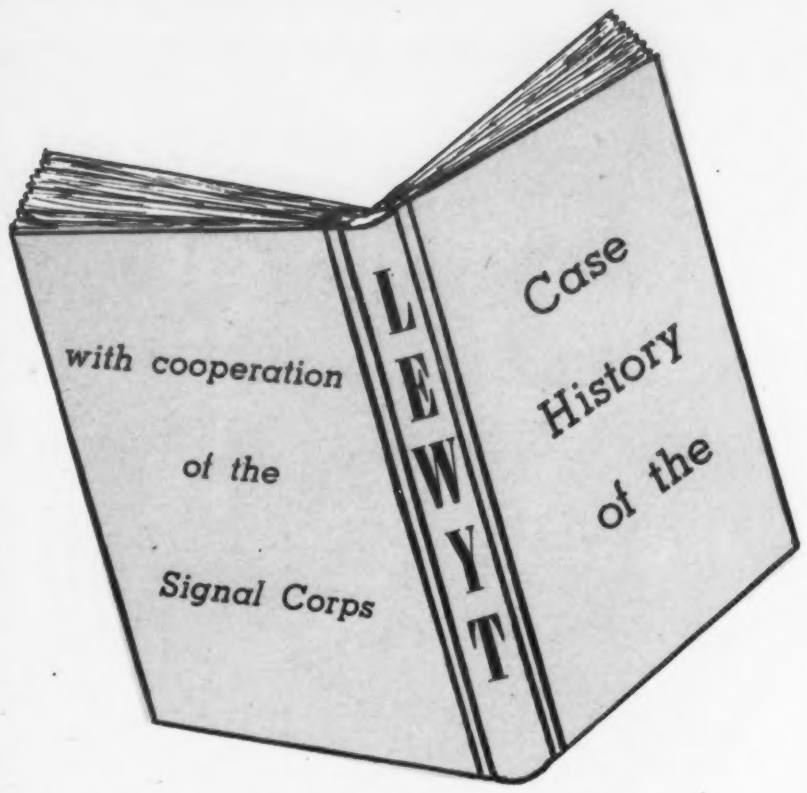
New antennas! Refilled Fire extinguishers! Repaired holes in the roof! Bigger engines! Bigger fuel tank! Bigger shock resistant transmitters! Try radioteletypewriter! More bonding! By 1944 the car was almost satisfactory; that is, from a communications standpoint. On the other hand old age and the multitude of holes bored and discarded over two years made every succeeding mile a continuing surprise. Wiser heads predicted a fate similar to that of the "One hoss Shay."

During the latter part of the year the old car had two 25-kw diesel engines, two 339 transmitters, radioteletypewriter equipment, several F. M. 50-watt transmitters-receivers, a code room, train battery rectifiers, an air compressor, 32 110-volt converters, a telephone exchange and a fair office-lounge. There was enough gear aboard to put out a field telephone guard line, "handie-talkies," 25-watt portable units and a public address system for back-platform use.

The difficulty was overcome. The President was in communication with the world throughout his rail travels.

(*Continued on page 76, col. 2*)

By special balancing of the new communications car for the Presidential train, it has been possible to install heavy equipment to one side, making room for a partitioned corridor. This corridor is important for both safety and communications security.



DY-88

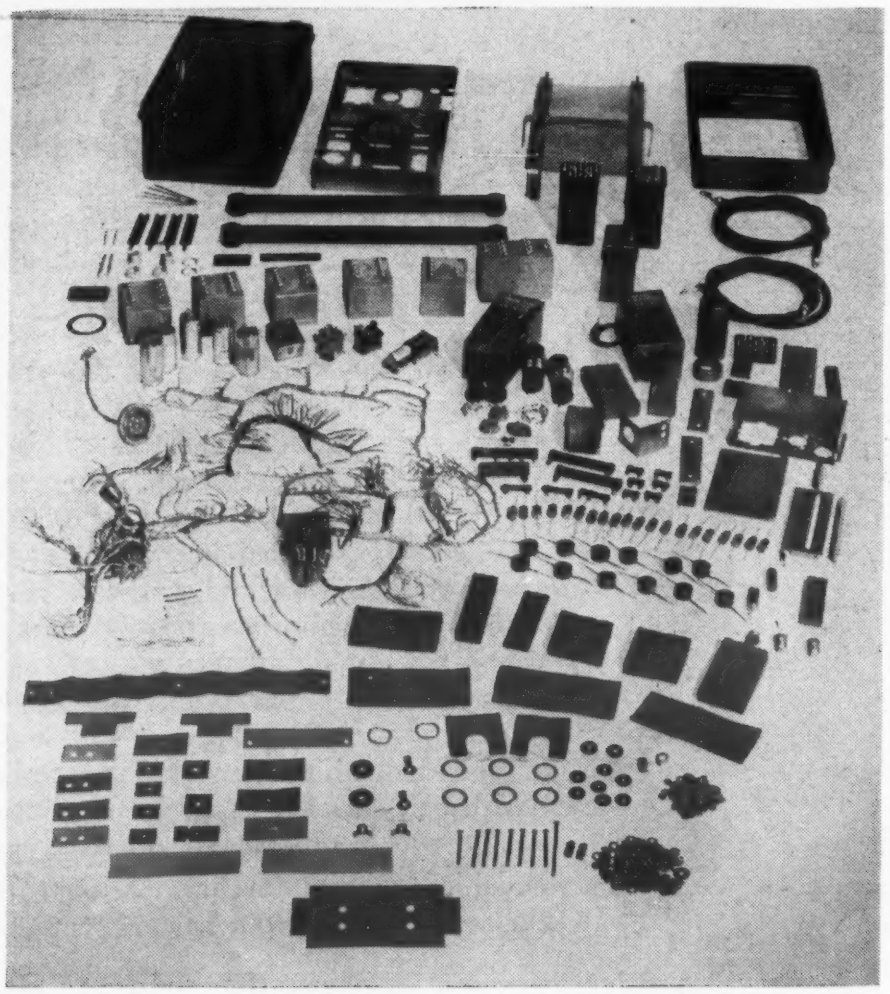
Foreword

During World War II, the Signal Corps Engineering Laboratories at Fort Monmouth, New Jersey, developed a power supply unit for use with Radio Set SCR 694. This was the Vibrator Power Unit PE-237, a vibrator power supply that did the job for which it was engineered. It was used in all parts of the world under extreme combat conditions and gave noteworthy service. Later it was used as part of the Radio Set AN/GRC-9.

The PE-237 was primarily designed to operate from 6 and 12-volt systems which, during World War II were used in most vehicles. Following the war, there was an increasing trend toward the use of 24-volt electrical systems in vehicles which, with time, became widespread. Since 24-volt systems were not much in use during World War II, there was a very little field experience to draw upon. The Signal Corps Engineering Laboratory in their design could not possibly have foreseen or anticipated the problems that arose from such a widespread change-over to 24-volt systems. Authorities had decided upon 24-volt vehicular electrical systems since these required far less copper.

Upon review SCEL considered the possibility of re-designing the PE-237 so that the life of the VB-16 vibrator at the 24-volt input would be extended. On investigation of the problem, recent technical developments indicated that a more compact power supply with a much greater life expectancy at a saving in cost to the government was feasible and could be developed. The Signal Corps is keenly interested in new developments that will cut cost, size and maintenance of equipment for which they are responsible.

Exploded view of the Vibrator Power Supply PE-237 showing all components.



Case History

Signal Corps engineers in the Power Sources Branch at Squier Laboratory decided that with the progress already made in parallel fields in the direction of miniaturization, it was possible to develop a dynamotor power supply that would be smaller and more compact than the PE-237. Therefore they decided to initiate such a development program and in January 1951, a research and development contract was awarded to the Lewyt Corporation. Lewyt, having manufactured many millions of dollars of AN/GRC-9 radio sets, knew the characteristics of the set and were in a most advantageous position to take on the research and development of the DY-88.

SCEL engineers drew up specifications for a new Power Supply that was far removed from the PE-237, and which subsequently was designated Dynamotor Power Unit DY-88/GRC-9. The primary objective was weight and size reduction with equal reliability at all input voltages. Accessibility of components for maintenance was also a paramount factor as was greater simplicity of construction.

When Lewyt engineers met with SCEL personnel to discuss the overall problems of the design and development of the DY-88, it was decided to set a target for a

A New Dynamotor Power Supply Unit

Fewer man hours and less assembly time are required on this new Power Supply Unit which has been developed by the Lewyt Corporation under contract with the Signal Corps.

unit that would have a total weight of 25 pounds. This would represent a weight reduction of 70% and also be approximately 30% smaller than the PE-237. This of course, was below the specifications set in the development contract.

The dynamotor was required to operate from three different input voltages, 6, 12 and 24-volts. The only prototype of its kind built up to that time, weighed approximately 30 pounds and was, therefore, of itself heavier than the target weight for the entire DY-88.

The use of a dynamotor for the high voltage was considered a most practical solution for the required inputs. A dynamotor would be a considerable improvement over the VB-16 vibrator previously used. It was further decided to use a different vibrator for the low voltage supply since, within its power rating, it would afford the reliability required within the space and weight alloted to it in the overall unit. The dynamotor posed problems as to size, weight, performance and life, since no dynamotor existed that could meet the specifications set by SCEL. These specifications called for a dynamotor that would pass a 1000 hour minimum lift test with a brush change permitted at not less than 500 hours.

Because of the severe limitations of size and weight, it became apparent that much research and development would have to be effected. Circuit simplification would have to be realized to a much greater degree than had been anticipated and new components, including a dynamotor of a size and weight small enough to fit the new limitations, would have to be developed with performance characteristics beyond those of anything recently available.

Considerable research and development went into designing a dynamotor that would meet these specifications. The unit which was finally accepted weighed only 10 pounds. This was primarily accomplished by finesse in design and by operation at higher speeds which permitted more efficient operation and simplified switching.

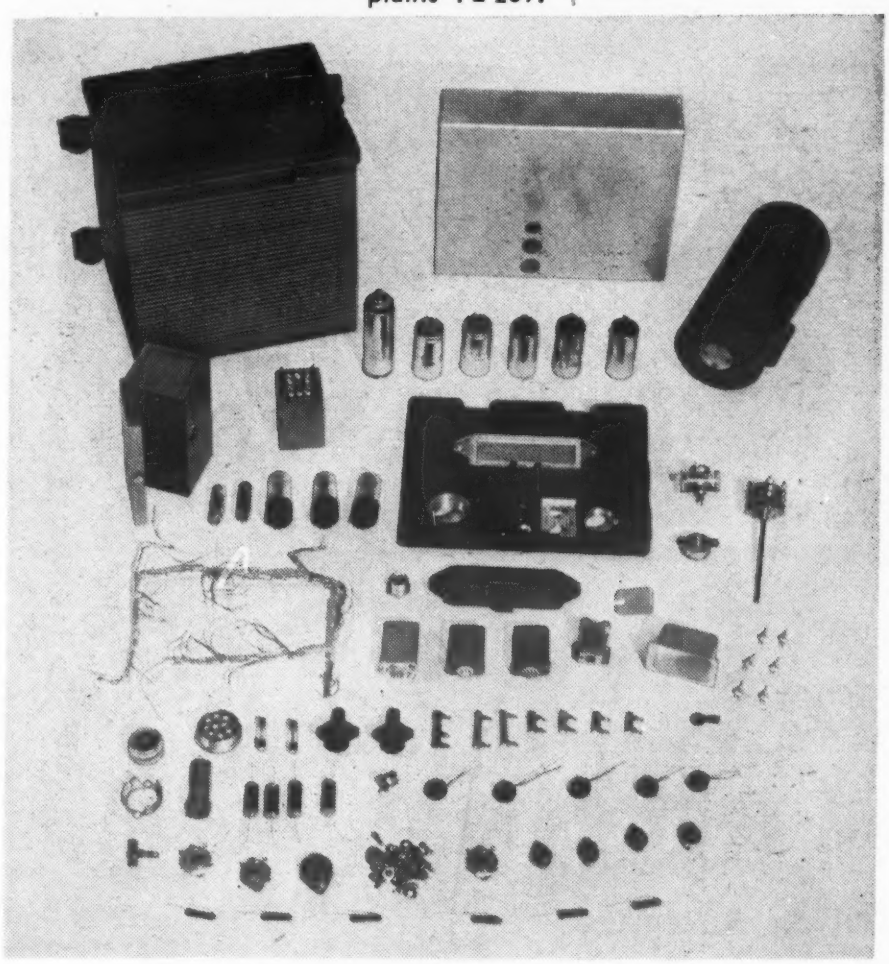
As development progressed meetings were constantly held between Lewyt Corporation engineers and the engineers of Squier Laboratory. Cooperation between both groups was of the highest order.

By simplifying the transmitter filament regulation system, a large number of components and wiring was eliminated. The use of the dynamotor removed the necessity for five large cumbersome transformers and their resultant wiring as well as the large, very critical VB-16 vibrator. For standby purposes, the new power supply uses a single inexpensive time-tested low power vibrator.

On October 1951, just eight months after Lewyt had received the development contract from SCEL, the first prototype of the DY-88 was delivered to Squier Laboratory. This prototype proved beyond any doubt that the specifications could be fulfilled.

Initial tests indicated that the design was successful. Since requirements for the DY-88 would be very large, a single source of supply for the dynamotor would be

Exploded view of the Dynamotor Power Supply DY-88 which supplants PE-237.



inadequate and strategically undesirable. Consequently two sources were developed and brought into the production picture. Since certain parts of the dynamotor must be interchangeable in order to meet maintenance problems and stocking of spare parts, it was necessary that designs be coordinated to insure this object. Tolerances, cross-sectional sizes, length, spring dimensions, brush grades and radii were compromised to compensate for basic differences and manufacturing techniques involved in the units.

After type testing of the first prototype, the design was reviewed in the course of an engineering meeting between Lewyt Corporation and SCEL. The resulting modifications were incorporated in a 2nd prototype, and on the basis of the performance of this unit, it was decided by SCEL that full scale production should be initiated as soon as possible.

Lewyt had met the original specifications set forth by SCEL and in many respects exceeded these specifications.

G. B. Ellis (center), Chief of the Power Sources Branch, SCEL, Squier Laboratories, Fort Monmouth, discusses the new DY-88 Dynamotor Power Supply with Arnold M. Wolf, (left), vice-president in charge of Manufacturing, Lewyt Corporation, and Jerome L. Strauss, vice-president of Contract Sales, Lewyt Corporation.

Rewarding Results

The problems that arose and were overcome were many and a tribute to the close cooperation of the development engineers from both the contractor and Signal Corps. The problem of heat dissipation inherent in a design of this nature was overcome by utilizing a corrugated case of Lewyt design. Not only was the heat dissipation increased by this construction, but the required rigidity and strength were obtained with a minimum increase in weight.

Alex M. Lewyt, President, Lewyt Corporation.

RF conducted and radiated noise also presented a serious problem since the normal limit for suppression of this interference was extended to 1000 megacycles. However, strategically located filtering soon overcame this.

Shortly after delivery of the first model, relay experience in the field dictated the use of hermetically-sealed units. It was at first felt that this would automatically increase the size of these units. However, miniaturization of the relays actually reduced their size and in addition provided plug-in mountings, making them readily replaceable in the field and interchangeable in the course of production and test.

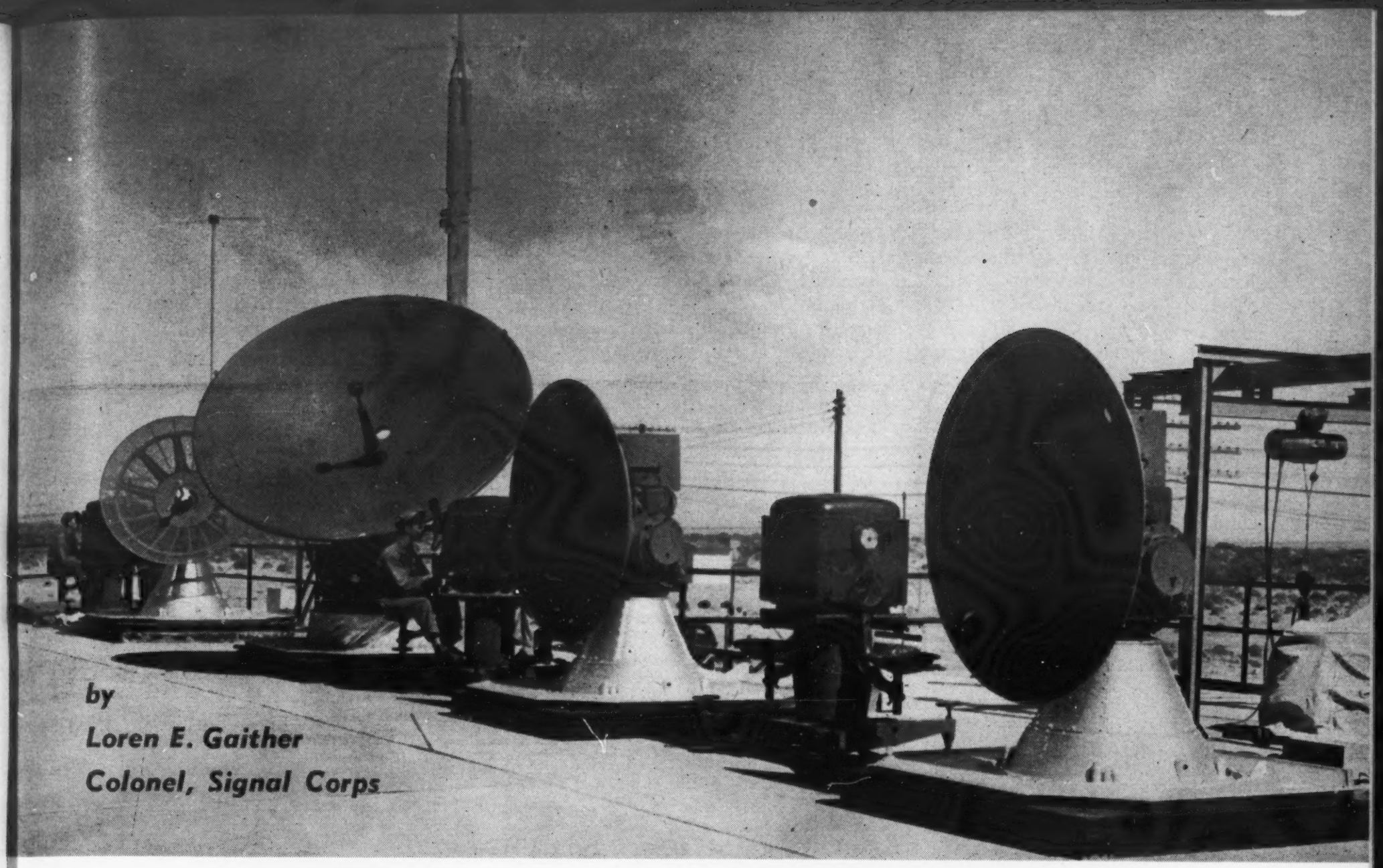
In designing the DY-88, Lewyt engineers in conjunction with SCEL engineers vastly simplified its circuitry and therefore decreased the amount of wiring and soldered joints by almost 90%. The number of components was reduced by 70%.

This has made possible considerable saving to the government. From a manufacturing point of view, fewer man hours and less assembly time are required, thus permitting faster and more streamlined production.

While the PE-237 weighs 89 pounds, the new DY-88 which replaces it, weighs only 33 pounds, a saving of 56 pounds per unit. Projected over the estimated requirements of the Signal Corps, the saving in critical materials totals 1000 tons. This material can be used either in defense or in civilian production.

Not to be overlooked of course, in addition to the saving in money and critical materials, is the greater reliability of the DY-88. It will perform with equally high efficiency from either a 6, 12, or 24-volt input. Its simplified design makes for far greater accessibility of components and ease of maintenance in the field which is of prime importance to both the GI and higher headquarters. Its reduction in size and weight over the PE-237 makes room available in combat vehicles for additional essential equipment.

The usual time lapse from the date a contract is awarded until a development is accepted by SCEL engineers is 24 months. In this case, Lewyt completed its contract with the Signal Corps in a total elapsed time of only 16 months. It should be pointed out that the very rapid completion of this program is a tribute to the technical ability and high degree of cooperation between Signal Corps personnel and Lewyt Corporation.



by
Loren E. Gaither
Colonel, Signal Corps

Riding the Range a la '52

The last two issues of SIGNAL *carried articles about the Naval Research Laboratory's part in the experiments at White Sands. Now Colonel Gaither tells the Signal Corps story.*

There is a strip of flat, waste-land in southern New Mexico which, during all the generations of recorded history, has drowsed under the warm, clear skies of the South-west. The White Sands are still there; the coyotes yet, silently move across the yucca and sage flats—but something new is noted . . . it's Buck, riding the range, in an old V-2, Ki! Yi! Yi! Yippee—Yay!

The old days are gone forever—that's for sure!

The White Sands Proving Ground, near Las Cruces, New Mexico, is a Class II installation under the Chief of Ordnance, United States Army. Here, Army, Navy, and Air Force personnel direct their missiles into space, far into the upper reaches of the atmosphere and, although not recognized, normally, by many, Chain Radar, a Signal Corps "hand," rides along. C. R. doesn't care where he is going, but he "shore" wants to see where he has been! Further, he *does* have a fatherly affection for all missiles and can advise, when necessary, a firm hand of command to the erring one!

White Sands Proving Ground is the nation's largest land-range for the testing of guided missiles. Here a maze of experimental work is performed in which missile aerodynamic-properties are determined and guidance and control mechanisms are checked in full-scale, free-flight tests. Some missiles "pack" experimental equipment into, and beyond, the outermost regions of the earth's atmosphere. Ki! Yi! Yi! Yippe-yay!

The range, which the Ordnance Corps maintains for the benefit of all Services, is roughly 40 miles wide and 120 miles long, with an area in excess of two million acres. Commensurate with the expanse of this installation, and the broad program which is being undertaken, extended networks of instrumentation and communication facilities are required for operational-control and collection-of-trajectory-data. Because of its extensive background of experience and its special skills in these fields, the Signal Corps, U. S. Army, has been designated to ride the range—a la '52!

The Signal Corps, U. S. Army, has been assigned the mission of providing direct support to the guided-missile programs which are being "proof-read" at the White Sands

Proving Ground, at adjacent Holloman Air Force Base, and at Fort Bliss by the Departments of the Army, Navy, and Air Force. This mission is accomplished by the Signal Corps White Sands Agency, originally known as Signal Corps Engineering Laboratories (SCEL), Field Station Number 1. This Signal Corps service consists of:

1. Equipment for Missiles.
2. Ballistic Radar Instrumentation.
3. Frequency Coordination.
4. Acquisitation Data.
5. Flight Safety and Drone Control.
6. Automatic Data Recording.
7. Missile Impact Prediction.

The Field Station, under Evans Signal Laboratory at Belmar, N. J., serves the Signal Corps directly in collecting data from rocket-firings for

The instrumentation section of an Aerobee sounding rocket (dummy grenade structure) with nose cone in background and an AN/APN-55 beacon, formerly used, being compared with the new AN/DPN-19 beacon.

use in studying temperature, pressure, composition, and wind-velocity in the upper atmosphere. Also sound ranging equipment, developed in the Signal Corps Engineering Laboratories, is used in conducting certain phases of upper-air research—in addition to assisting in the prediction of missile impact-points. A few subsequent paragraphs will be devoted to some of the extremely-interesting results of this research.

(Use *White Sands* Brand! The *New* Star-dust! Puts *pep* in your petunias and *zip* in your zinnias! 25 pounds—25 cents!)

The chain-radar system, extending the length of the Proving Ground, is integrated electrically with automatic plotting boards, data-recording equipment, data converters, and communication equipment for transmitting data of "in-flight" velocity and position along the X, Y, and Z axes. These three-dimensional data of range, azimuth and elevation are available, instantaneously, at many points on the range and are automatically corrected for parallax at each station! Chain Radar provides electrically, in addition to missile trajectory-data, the information required for flight-safety, drone-control, and missile impact-point prediction.

The Signal Corps also has developed a series of radar beacons which enhance the efficiency of the chain-radar system in tracking a missile at greater ranges with much greater accuracy. The developed transponder-beacon, located in the missile, retransmits a pulse upon reception of a pulse of a certain frequency, from the radar. The strength of the signal received by the radar thus can be increased by proper design of the beacon.

Beacon units are available in various sizes. Their dimensions vary from six inches in diameter and twelve inches in length, to two and one-half inches in diameter and six inches in length. Weights of these beacons vary from two to twenty pounds. Installation of beacons is dependent upon space, payload available, and the technical requirements of a missile. Beacons are available to perform various command-functions when desired.

The associated beacon-batteries must meet a number of stringent requirements in terms of weight, size, voltage and current capacities. They must operate under conditions of severe shock and vibration and provide service for periods ranging from thirty minutes to two hours duration. The high-current capacity needed in the "A" Battery led to the development, by the Signal Corps Engineering Laboratories, of "one-shot" batteries which use potassium-hydroxide as electrolyte and zinc-silver-peroxide electrodes. These batteries are very small and are used when space is limited. Lead-acid batteries are used where space and weight are not critical.

Various types of antennas are available for beacon transponders. Selection is dependent on target requirements. Turnstile antennas can be used on a stabilized missile if only one chain station is required since radiation is directional towards the tail of the missile. Slot antennas are omnidirectional and can be used on unstabilized missiles or when more than one chain station is required. These antennas are flush-mounted and offer less drag than turnstiles. Stub antennas are normally mounted on the underside of an aircraft fuselage. The stubs have an antenna pattern suitable for tracking from any of the chain stations when flown above 10-000 feet altitude.

The chain-radar system consisting of five stations, is emplaced along a north-south axis of, approximately, one-hundred miles in length. At each station, equipment converts the missile's position in space, as previously mentioned, into quantities which can be transmitted by electrical means. This electrical information is then fed to a transmission "bus" and is used to automatically position the other radars or special devices such as phototheodolites and telemetry antennas. Any one of the five stations can be placed in control, immediately, by the chain commander at the main (C) station from the C Station console. The quality of information being gathered by all radars is presented on the C Station console and the chain commander selects the best of the group for control. Data is handled over a wire -VHF-UHF system.

The chain system uses modified SCR-584 radars with ten-foot parabolic antennas, photographic recording-cameras and cursor scales for angular recording, boresight telescopes for correcting tracking errors, and automatic range tracking.

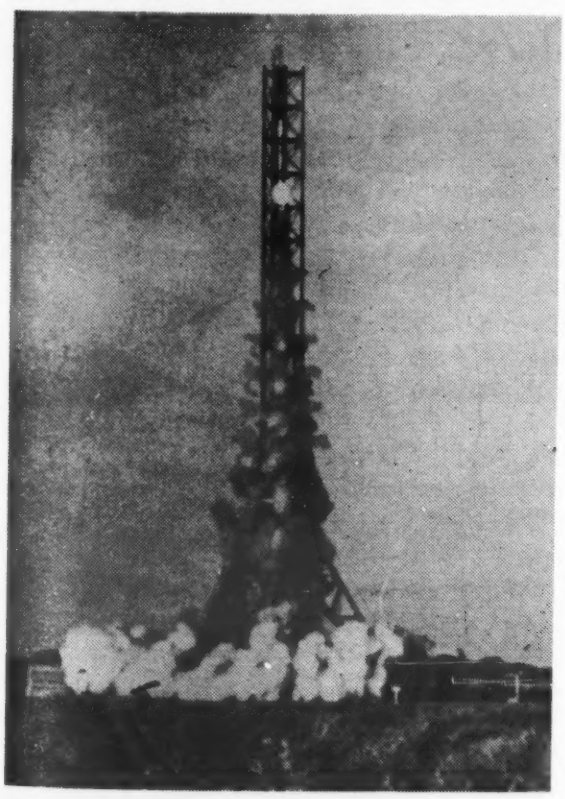
During the firing of missiles at drones, the relative position of all aircraft flying over the Proving Ground must be accurately known. A typical operation involves one drone, two control-director-ships, and a missile. These are in the air simultaneously. Radar sets track each of

the aircraft involved as well as the missile, and this information is presented upon three automatic plotting-boards. Predetermined flight patterns are laid out upon the plotting-boards and are used to control the flights of the aircraft during operations. Independent control of the drone is effected from the radar set tracking the drone and commands are, appropriately, sent through the radar link to the drone, causing it to conform to the pre-arranged pattern on the plotting board. The drone can be controlled by a communication link between either director-ship and the drone. After each firing, one of the director-ships is directed, by radio communication from ground control, to a position where it can take over control of the drone and land it—if it wasn't shot down! One director-ship is always in standby.

The chain radar system is valuable, not only for continuous acquisition of data on long-flying horizontal missiles, but also for providing a means of obtaining more accurate terminal or impact data for missiles flying a ballistic trajectory. The equipment displays a continuous plot of the missile's trajectory during flight.

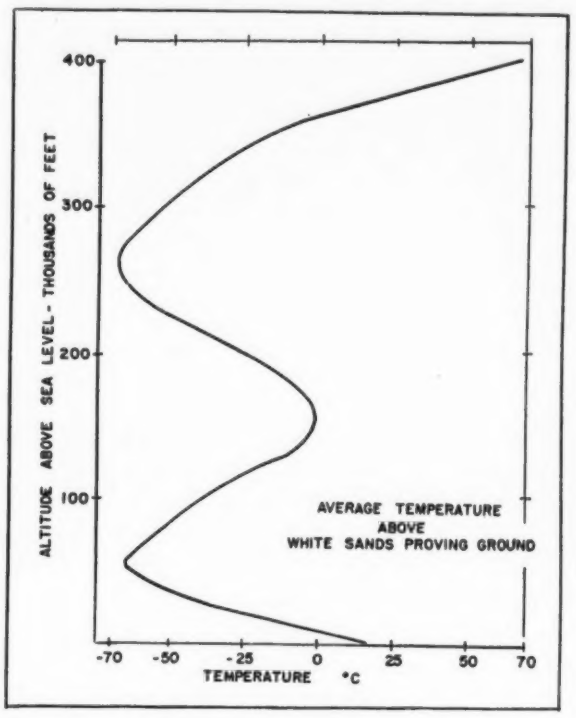
Chain-radar stations provide two-pen plotting boards for recording in-flight trajectory information. The information presented upon these boards is accurate to approximately 100 yards in 100,000 yards of range. This information is available during flight and provides permanent, trajectory information in the form of radar-plots immediately after flight.

Range, azimuth and elevation data of missiles in flight are photographically recorded. This information is derived from the servos in the radar sets. Data recorded in this fashion provides accurate trajectory information when the radars are skin tracking. (The accuracy of data, when the radars are tracking a beacon, is considerably higher.) These data can be reduced to give X, Y, and Z coordinate information at the rate of 100 points of trajectory per three hours. The high degree of accuracy in range is due to the 2,000 yard range-scope on the data display which effectually acts as a high-accuracy vernier for the range dial.



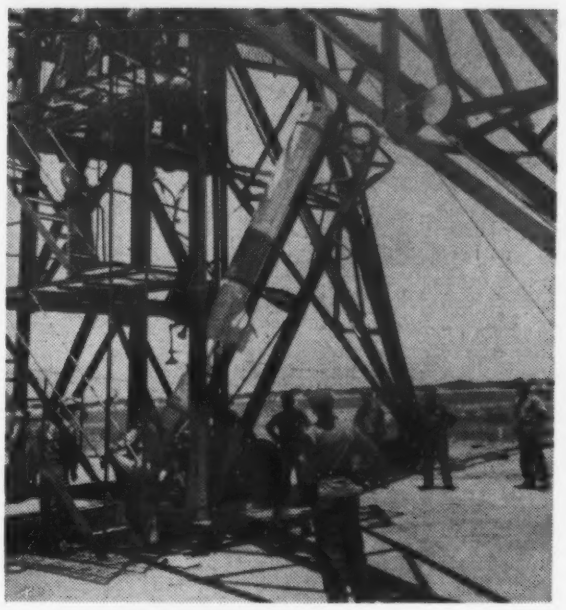
The Signal Corps Engineering Laboratories took this picture showing a rocket leaving the Launching Tower.

Azimuth and elevation data of missiles in flight are photographically recorded by the use of cameras on the boresight telescope and cursor scales. Information obtained of azimuth and elevation from the cursor scales are corrected by photographs taken through the boresight camera. Range data, also, is recorded by photographing the range-scope and dial of the data display-unit. Boresight and cursor equipment gives angular information which is many times more accurate than the recorded radar data. These data can be reduced to X, Y, Z coordinate information at the rate of 100 points of trajectory per five hours.



This graph demonstrates the average temperature above the Proving Ground from experiments made there.

The automatic data recorder is a recent development replacing photographic recording of the data-display unit. Range, azimuth and elevation data are derived from electrical servos in the radar sets. Magnetic drums in the recorder convert this data to digital form; after this conversion it is recorded on magnetic tape; then the magnetic tape is fed to equipment which transfers the data to teletype punched-tape which, in turn, is used to prepare IBM punched cards. These cards are fed to an IBM Calculator which computes the position and velocity components of the missile and tabulates the results. No manual processing is involved and complete reduced data is available within an hour or two depending upon the duration of the flight.



This view shows the rocket and booster being raised into the Launching Tower during experiments at White Sands.

White Sands Signal Corps Agency with the concurrence of the Departments of the Army, Navy, and Air Force, has responsibility for all frequency allocation and electromagnetic interference elimination in all USA territory within a 150-mile radius of the White Sands Proving Ground. Three ground-monitoring installations have been provided by the Signal Corps. Monitor aircraft, mobile units, direction-finding equipment, prime frequency-standards, and receiving equipment are available. The entire radio spectrum may be covered.

During preparation for missile flights, all monitoring installations are operated, keeping close watch on all frequencies which will be used. Evidence of interference or excessive frequency drift is reported immediately to the missile project-officer and efforts are made to locate and to silence the sources of interference. A complete report of all monitoring-results is forwarded to the agency concerned after the flight. Recordings are made of all transmission characteristics such as frequency intensity, frequency drift, and time marks, used by agencies during missile-firings which are associated with critical functions such as telemetering, guidance, or destruction. Copies of these recordings are available to concerned agencies.

In addition to providing essential technical services to agencies launching missiles on the range, the Signal Corps has been utilizing rockets at White Sands Proving Grounds as part of a rather extensive, upper-atmosphere research program. During the

(*Continued on page 74, col. 3*)

CARGO PACKERS

Shock-Proof, Climate-Proof Packgi

Right after World War II, when almost everyone was reconverting to civilian thinking, Mr. Julius B. Kupersmit founded a company dedicated to solving the problems of preservation and protection of military equipment, especially the delicate and precise gear of communications, photographic and electronic fields. He called this company Cargo Packers and started operations in 1500 square feet of rented space in New York City. Although the building was over 150 years old, everything else was new, and Mr. Kupersmit put to work the ultra-modern packaging and packing ideas he had developed during his war-time work with the U.S. Signal Corps Inspection Agency. The electronics industry was quick to recognize the value of a service which specialized in packing their product for maximum protection at minimum cost. Within seven years of operations Cargo's volume increased from $68,000 for the first year, to over $1,000,000 in 1952. This fourteen-fold increase indicates the terrific pent-up demand the unique new company had developed and the effectiveness with which its services were applied.

Of course, the original space was insufficient to handle the avalanche of new business, and the same thinking which had been used to start the company was extended to the design of a new building specifically established for the new methods of preservation and protection required in its work. A specially laid out plan for a packing factory, engineering and office space was drawn up, and a new one story brick and glass building encompassing over 27,000 square feet was built to exacting specifications in Brooklyn, New York. The old building was retained for work on the overflow and special local type of business. Now Cargo's facilities include all the original equipment and space plus the new layout with many newly developed pieces of apparatus used in packing. Mr. Kupersmit has developed and patented at least four new devices to improve preservation, protection, and marking operations, and is an active member of the Packaging Institute interested in all new ideas in that special field.

Julius B. Kupersmit, President, Cargo Packers, Inc.

The operations of Cargo Packers may be roughly divided into Consultation and Design, Production Packaging, and Research and Development. This article will briefly describe the work performed along these lines.

Consulting and Design

Among the clients for whom Cargo Packers has handled this type of work are: Amperex Electronics Corp., General Precision Laboratories, Radio Receptor Corp., Times Facsimile Corp., and other well known firms. Deserving of special mention is the fact that a completely new package testing laboratory has been designed for the Signal Corps on a direct contract basis, by Cargo Packers.

Cargo Packers is very proud of its first job at the very outbreak of the War in Korea, when it was called upon to help in a most serious situation. The well known SCR-584 equipments were desperately needed, but packing them required large amounts of desiccant to prevent deterioration by moisture. There was a shortage of desiccant at that time, and the only such material was in bulk form and not in very good condition at that. At first the compound was literally shoveled into the equipments. Cargo salvaged all the desiccant by reconditioning it and packaging the dehydrating chemical in large units for insertion into the packs. This was performed at the Baltimore Signal Depot and helped get the important radar gear ready for rapid overseas shipment.

Cargo Packers, who have devoted their efforts to the solution of the unique packaging problems of the electronics and photographic industries, represent the new generation of packaging men who have answered the call with care and economy.

ckging for Industry and the Services

Production Packaging and Packing

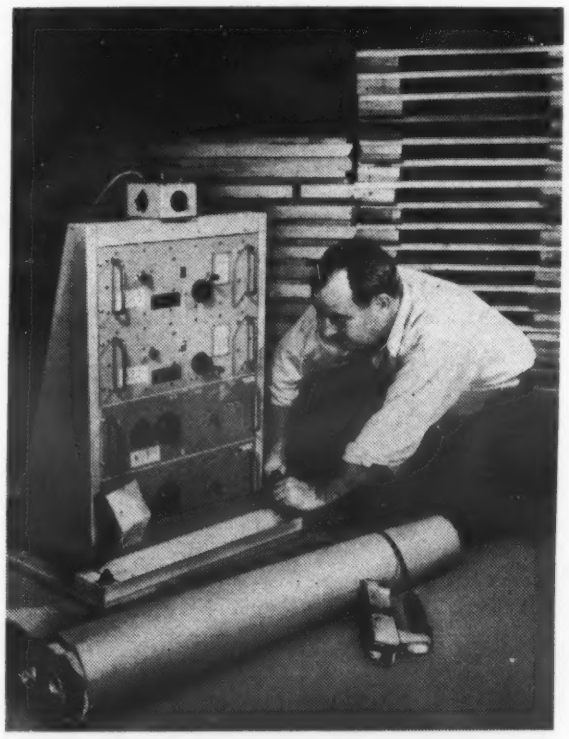
Cargo Packers has used its unique factory lay-out to advantage for performing the complete protection and preservation job, plus the handling of the required Government Inspection liaison plus the shipment of the packed materiel direct to the Government destinations. All that the contractor is rerequired to do is ship the equipment to Cargo, already technically inspected by the Government Inspector, and then send the required invoices to the Government with the copies of the MIRR furnished by the Government Inspector stationed at Cargo Packers full-time. The popularity of this service is evidenced by the list of contractors who use it. This list would read like a condensed "Who's Who" in electronics. Such firms as Allied Control, Recordak Corp.; Thomas A. Edison Inc., Federal Telephone & Radio Co.; General Electric Supply Co.; Tele-King Corp.; Conmar Prods. Corp.; Price Electric Co.; Mark Simpson Mfg. Co.; Transmitter Equipment Mfg. Co. Many others are and have been customers of Cargo's Production Packaging Service including the U.S. Government. Another way of looking at the accomplishments of this important side of Cargo's business is to list a few of the equipments so handled: GRC Standardized Series. Teletype Equipment, Switchboard BD 101, Interphone Equipment RC-298, Facsimile Equipment AN/TXC-1, AN/TRC-4; Public Address AN/TIQ-2 and others.

Still another service performed to order by Cargo is the fabrication, in quantity, of a special internal support, such as a Squirrel-cage, which has been specifically designed to do an effective and economical packaging job for any piece of equipment. This can be done for companies who can assemble and package, but who are not in a position to fabricate the special supports and fillers.

Research and Development

It is in this department that Cargo takes the most pride. Especially difficult and delicate equipments require the knowledge of a specialist to establish a design which will adequately protect and preserve, while still being economical in cost and space. This problem may be difficult for equipment designers and production men, but is taken in stride by the packaging engineers of Cargo Packers.

This photo shows packaging method 2A being used on a piece of equipment packaged by Cargo Packers.



Some will say that equipment designed for military use should be able to withstand rough handling, since it won't be treated with kid gloves by the men on the battlefield. This may be true of many items, but unfortunately the very nature of much of the important electronic components and equipments makes for delicacy and fragility. In other cases there will be the need for maintaining extreme precision. This problem may be likened to the ancient story about the futility of creating a substance which will dissolve anything, since no suitable container could be devised for it. In the combination of fragility of product and the necessarily rough nature of handling storage and transportation under military conditions, we have a parallel situation.

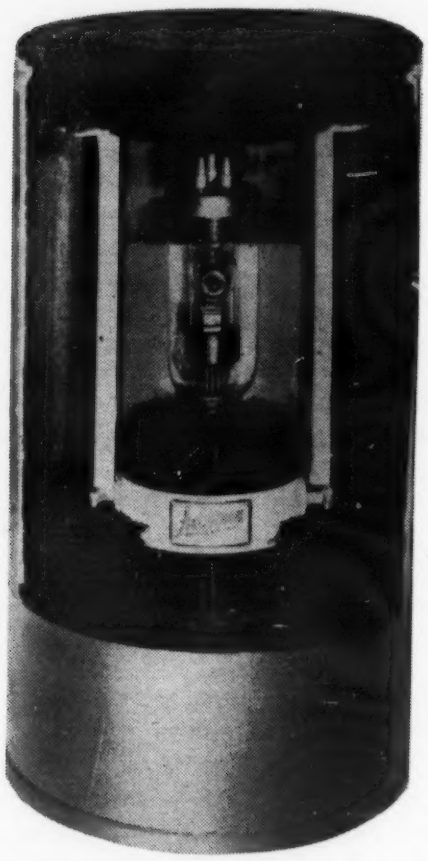
The Signal Corps and other branches of the Army, Navy, and Air Force must furnish to the Forces in the field communications equipment, electron tubes, photographic equipment and supplies, radar gear, and test equipment which is very carefully designed and manufactured to do the job required. The Armed Services maintain extensive laboratories and inspection services to check the design and final quality of

the product before shipment. If these equipments do not reach the personnel who require their use in the same condition as when the material left the plant of manufacture, then the function for which they were furnished will not be performed. Communications can be disrupted, enemy planes will go untracked, and battles can be lost. Cargo Packers take it as their job to do the best that scientific packing knowledge can do to prevent such happenings.

To understand the problem we must realize that packaging and packing of delicate equipment for even ordinary domestic shipment is complex and difficult, so imagine, if you will, the situation brought about if the packs have to meet tests like those described below. These tests are taken from Specifications MIL-P-116A which covers Methods of Preservation.

Free Fall Drop Test: This is a test consisting of dropping a container weighing up to 200 pounds on each of the eight corners from a height of 2½ feet onto a solid steel or concrete surface.

Immersion test: This test is applied after the drop test, and consists of immersion in water for an hour, and then after four hours the container is opened



This cross-section shows Transmitting Tube 891R packaged so that it is climate-proof and shock-proof.

and examined, and there should be no sign of dampness within the unit pack nor any evidence of corrosion on the equipment inside.

Water Spray Test: This test consists of playing a spray of water at least at two gallons per foot per hour for four hours.

Cyclic Exposure Test: This test consists of placing the container in a temperature chamber and then running the

The above view shows the cleaning and processing section of the main plant at Cargo Packers.

temperature from room temperature to 120° F., then back to room temperature, down to 0°, then up to normal refrigerator temperature. This is repeated three times and then the package is put under for four cycles. Of course the inside of the package and the equipment within it must show no evidence of wetness or damage or corrosion after this test.

The above tests, though very severe, are needed to simulate the weathering and handling conditions possible when material is sent overseas to advance supply bases and stored at such bases. We must remember that any item purchased by the Military may eventually end up at an advance supply base.

Mr. Kupersmit and his staff know that while ordinary packing is sufficient to protect against regular domestic shipment under commercial conditions, the military situation with its attendant rough handling and extreme urgency demands, brings completely different conditions. The operation of packing must result in absolute protection against tests like those described above: dropping, water soaking, temperature cycling, etc. It is for this reason that many scientific instruments are employed to check the packs, and new and different packing materials are studied to find out how to make better, cheaper and smaller packs which still give the protection required.

How would any typical commercial, or even export pack you have ever seen on a piece of equipment or appliance, stand up under the drop test, immersion test, or the spray test? Not too well you'll agree, even though the appliance itself is sturdy enough. Now let us take a delicate special electronic tube, such as a magnetron, so necessary to keep our radar equipment functioning. Could we put such a device in an ordinary package, even to stand a simple domestic shipment? No, we would need special package designs to prevent breakage during commercial handling. Now we'll try the drop and immersion tests on the pack. No, you say, hold on, we'd better have the package checked first. Yes, it is a problem for an expert to produce a satisfactory package design to withstand all the tests required, *and* to keep the costs low in relation to the item involved, *and* to make sure that the volume of the package is a minimum, too.

Some examples of the special nature of the work in electronics packaging will serve to show the type of problems handled by Cargo's Research and Development Staff. Let us consider the case of a rotating anode x-ray tube, which contained a sealed-in glass electric motor. Whenever a heavy metallic device is tied in with a glass container, it is clear that with shock or vibration there is a high risk of breakage at the point of seal. Of course, the designers of the tube had devised a package for it, but it was bulky, heavy, and expensive in materials, and also it took two men one hour to pack each tube. Cargo Packers was called in, and as a result, a radically different approach in packaging was designed. It consisted of a specially molded pack of scrap sponge rubber, with a cylindrical hollow for the tube. The new reusable type was 60% smaller than the old, the material cost was reduced 50%, and the labor cost was reduced to less than one tenth man hour.

There is also the case of the large radiator type transmitting tube 891R, used in several important fixed station equipments. The original package was an outgrowth of the research of many years, and involved a large cage in which the tube was suspended by specially designed springs. To make the matter worse, the cage had a slanting roof, which prevented compact stacking. The material cost $31.00, and it took two men one hour to pack the tube. Cargo Packers were given the problem, and their designers came up with Fibre Drum enclosing die-cut animal hair in the rubber, and spiral wound so that the shock absorption can

be varied to suit the needs of each of the sides of the package. The new type of container for the 891R tube cost $7.00, one man could pack a tube in five minutes, and the cubic form of the container allowed vertical stacking. This should show just what scientific packaging design can do in a troublesome situation.

One important aspect in designing packaging which deserves mention here is the study of what is happening inside the package when it is dropped from over three feet to a concrete floor, or when it is vibrated to simulate rough travel conditions. It is not enough to just cut and try; it is necessary to check actual impact conditions, and accellerations, of the device inside the package. Here Cargo Packers use instrumentation very much like the design groups working in electronic equipment for the Armed Forces. Graphic recorders, recording accellerometers, compression testers, temperature and humidity chambers, and shower chambers are a few of the instruments which are used as tools by the packaging engineer. With these instruments it is possible to check the conditions in a simulated package undergoing the tests without subjecting the item itself to the test. For example, by using the recording accellerometer when a mock up of a package is checked, it is discovered that the inside of the pack transmits 10g decelleration during a drop test. Usually the equipment designer can tell just what the maximum decelleration is that the equipment can take or it can be determined from the equipment specifications. Let us assume that the device can take only 10g due to its fragility; if on the first trial of a package it is found that more than 10g is transmitted through the package to the inside, then a redesign of the dunnage, or filling material, is made, or other indicated action is taken. A retest is made, still not actually subjecting the fragile device to the test, until the accelerometer indicates that less than 10g is being transmitted to the packed item. When this is found, then the item is packed inside the package, and unless the previous tests were made poorly, there should be no damage when the package is subjected to the drop test.

The same procedure can be employed to check the protection offered by a package against moisture, compression and/or other conditions, just by using the proper instrument to measure the conditions wanted. The great advantage of this method of design is that just enough protection can be put into the package to withstand the impact, moisture, or other conditions which the packed item is likely to have to withstand. By this approach an economical and efficient design can be done. If merely a strong enough package to protect the item is made and tested, by actually putting the item through the test, it is not advisable to re-check with less and less protection to find the proper level to just withstand the test. It is clear that only experienced packaging engineers, with all the required knowledge and having all the necessary equipment can come up with the most economical package to meet a given situation. Cargo Packers are ready to show that this is true and welcome challenging problems which cause the equipment design engineers so much loss of valuable time.

Among the complications in packaging design is the effect of varying conditions of temperature, humidity and pressure upon materials used as dunnage. Complete studies have been made to determine just which materials retain their ability to absorb shock and vibration in the icy weather of the north, with tropical climate around the Equator, and under varying pressures resulting from high altitude flying. Some materials do an excellent job in temperate climates but become hard at low temperatures. Packages made up with these materials would be entirely unsatisfactory for use in Alaska and other cold climates. Of course it takes an expert to avoid such mistakes. Cargo Packers always uses weather chambers and compression tests to check material before using them in new package design.

One of the problems currently being worked on at Cargo is the possible reduction of freight rate classification for electron tubes. The research and development staff is continuously trying to show that the present requirement of twice the first class rate for express

Special scrap foam rubber mold packaging was necessary to insure the safe shipment of this rotating anode x-ray tube.

shipments is made unrealistic by the recently improved designs of the packages. Cargo hopes to be able to help industry cut millions of dollars out of its freight bills by effecting a reduction in the first class rate or lower by any common carrier for electron tubes.

A new amendment, which Cargo Packers was instrumental in effecting, to Specification MIL-P-75 now allows new and better package designs to be submitted and they will be accepted if the package will pass all the tests required in the Specification. Without the amendment, the Specification limited the design of packages for electron tubes to those described in the specification.

Cargo Packers represents the new generation of packaging men who have appeared to answer the needs of the armed service. That it is necessary to produce equipment which will perform the intended function is obvious, but one must remember that the equipment will never get a chance to function if it is not protected to withstand the transportation and storage cycles required before the time of actual use. At first the military packing requirements were regarded as fantastic, but at Cargo the tough requirements are not only accepted as necessary but the challenge of meeting these rigorous tests is welcomed. This is true even on delicate electronic equipment. We must not allow the mistakes made in the preservation and protection of equipment in the last war to be repeated. This will not happen if we learn to use the new knowledge now available to experts in the field such as the staff, engineers and workmen at Cargo Packers who have devoted their efforts to the solution of the unique packaging problems of the electronic and photographic industries.

Method 2B packaging line for RC 298 tank interphone systems is shown below.

USAF
Switching Systems
Plan 51

by Robert W. Downey
1834th AACS Group
(formerly 1060th AF Communications Group)

With the rapid growth of the mission of the United States Air Force in the past few years, the need for extension and improvement of the vital arteries of communications has become increasingly clear. The stepped-up tempo of the Air Force operation surpasses any previous experience—communications must keep the pace. Realizing this, Air Force planners in 1950 were well along with plans for a high speed, semi-automatic communications network to carry the record communications traffic within the continental United States. Early in 1951 the AIRCOMNET (Air Force Command Communications Network) was put into operation using equipment engineered and manufactured by the Western Union Telegraph Company. By eliminating many relay points and doing away with manual processing of relay traffic, messages are moving faster than was ever before possible. Using experience gained in the past two years of operation, the same system with additional modifications is being put into use for relaying overseas traffic. The two units now operating switching centers at the East and West coast relay points are scheduled to begin operation of this latest development in the first part of this year. The plant used in the new overseas switching centers will be much like that shown in photograph #1, which is a typical switching center aisle as employed in the ZI portion of the AIRCOMNET. A modification of the basic system is required, however, because of the comparative instability of radio circuits to overseas relay points. This consists of a tape repeater unit which receives the message when it is switched from the switching aisle and transmits it on the outgoing circuit or stores it until an operable circuit is available for transmission.

The units at Andrews AFB and McClellan AFB will be responsible for taking the new system (known as Plan 51.3A) through its shakedown period and smoothing out problems not encountered within the continental AIRCOMNET with its comparatively stable landline circuits. This will be the first attempt by the Air Force to use such equipment with radio circuits and should bring about a substantial increase in the speed of handling overseas relay traffic.

Briefly, the new switching method of transmitting a message from one Air Force installation to another involves the originating station cutting one tape and transmitting the message to a switching center. There an

Figure 1—This Air Force switching center with normal operating component and supervisor on duty is typical of those to be used in new overseas switching centers.

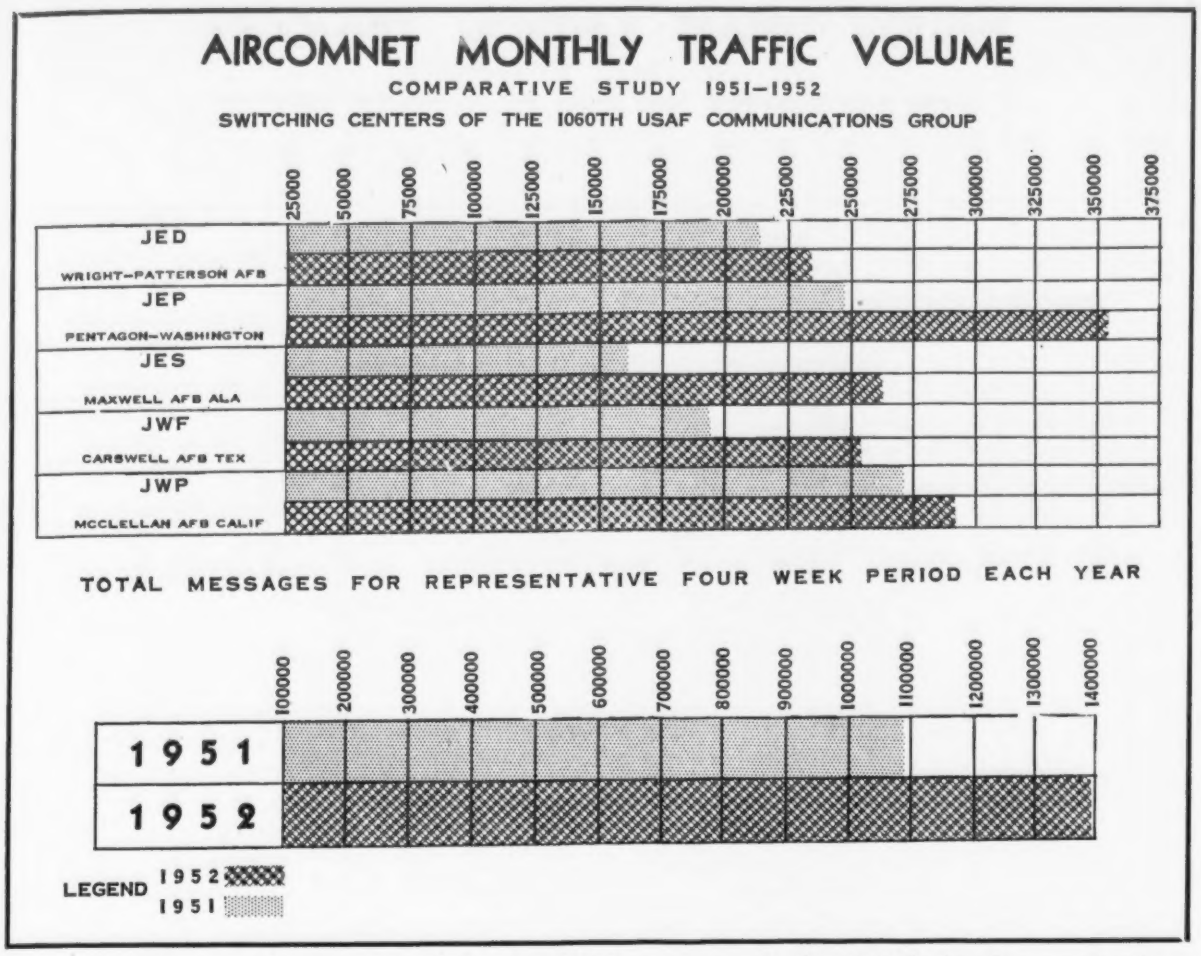


Figure 3—This graph presents a study of switching centers in the 1060th AF Communications Group which developed Plan 51.

operator scans the tape to determine the destination and presses the appropriate button which automatically sends the message on its way to the addressee or addressees, or to another switching center, even while it is being received. Where there are multiple addresses, there is a system of multiple transmission which sends the message to several stations simultaneously. This is in sharp contrast to the old system which required each message tape to be carried from one circuit to another and meant preparing a separate tape for each addressee. The reduction in handling time and personnel required to pass the traffic are the outstanding recommendations of the Plan 51 operation. Photograph #2 depicts an old type relay center as compared with the switching center in photograph #1. When one considers that the old equipment had about one-fourth of the traffic capacity of the new, the savings in space and time are obvious.

The change from the torn-tape procedure brought with it the need for an almost entirely new set of operating procedures because of the requirements of the equipment. Certain machine functions required by the semi-automatic methods were entirely new in Air Force procedure and had to be followed or the system would fail. The period of change was a difficult one but the WAF and the airmen who operated the system proved capable of rapid adjustment and in a very short time, a smooth operation was developed. Constant study and examination have enabled the 1060th USAF Communications Group to develop a Manual of Individual Responsibilities which completely covers the internal operation of a Switching Center and the requirements of each component job.

The graphs in Figure 3 serve to point up a situation that developed early in the operation of the Plan 51 AIRCOMNET, which could not have been foreseen when the system was initially engineered. The factors used in developing the switching center operation were based on experience gained in 1949. The advent of Korean hostilities and the resultant increase in military activity brought with it an increase in traffic which the original system would not carry. Studies were begun immediately and equipment ordered to permit augmentation of the network by what has been known as a "B" system. This simply means that an additional 30 positions were added to the original 60. During the fall of 1951, installation was begun; and at the Pentagon location, the cut-over was actually made in the Spring of 1952. The other units have completed this cut-over with the exception of the unit at Maxwell Air Force Base, where building difficulties have delayed installations. Prior to January 1, 1953, the system was operated by the 1060th USAF Communications Group commanded by Lt. Col. Frederick W. Shipe, under the supervision of Maj. Gen. Raymond C. Maude, then Director of Communications, Headquarters USAF. It has since been redesignated the 1834th AACS Group.

This modern and highly successful communications system is operated largely by WAF personnel. The skill and experience required by the USAF to inaugurate its new system was drawn from cadres of personnel long familiar with the now outdated torn-tape equipment. To these was added the first large scale application of WAF personnel to a specific field of operation. Assisted by Western Union engineers and instructors, the change was made; and the Air Force took a long step forward in the field of record communications. There will be further adaptations of the idea throughout the Air Force . . . Switching Centers are here to stay.

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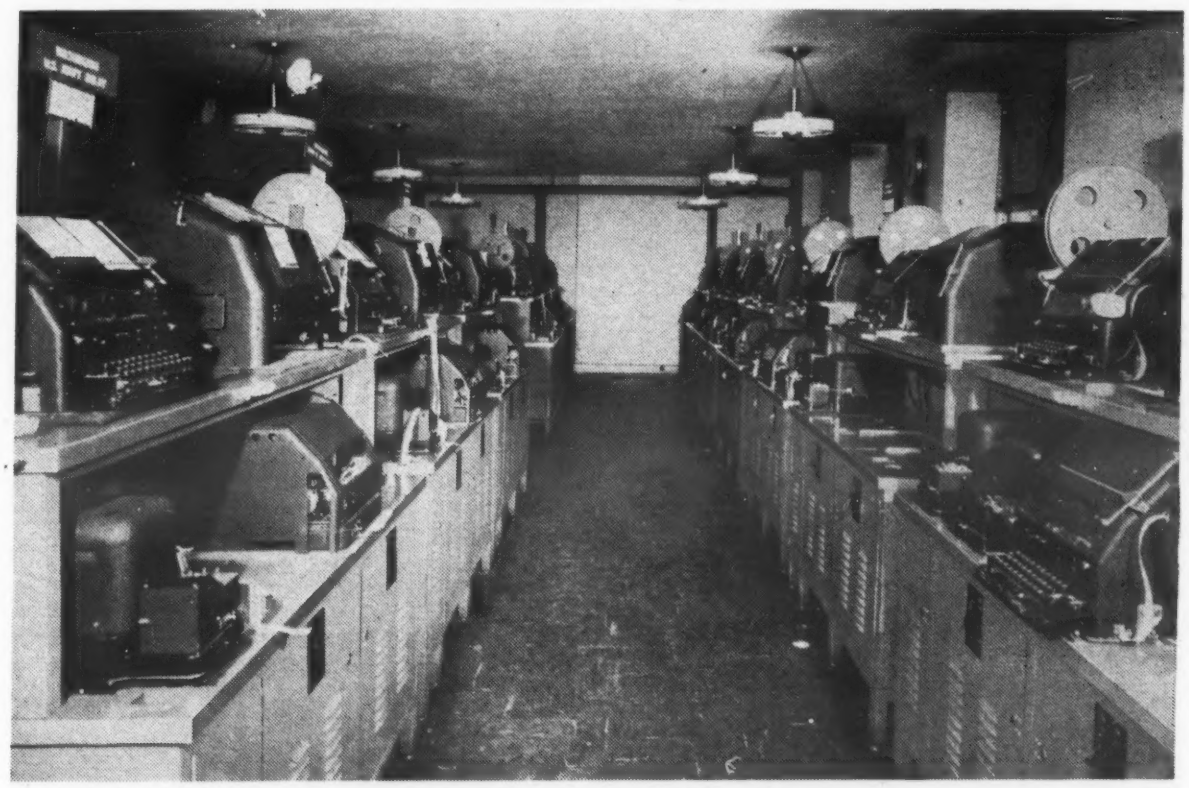
Figure 2—An old time relay center which has been outmoded and replaced by the switching center shown in Figure 1.



Another PHILCO First

When top-level planning groups within the military and industry discuss training materials for future training programs, more than likely they will think of Philco. This company has, through practical application and continued research, produced training materials that have been unequalled in field training to date—another Philco first!

In an interview with Herbert S. Llewellyn, assistant business manager of the TechRep Division, who is responsible for development and production schedules of training materials, it was learned that deliveries to military and industrial customers are being made in advance of deadline dates.

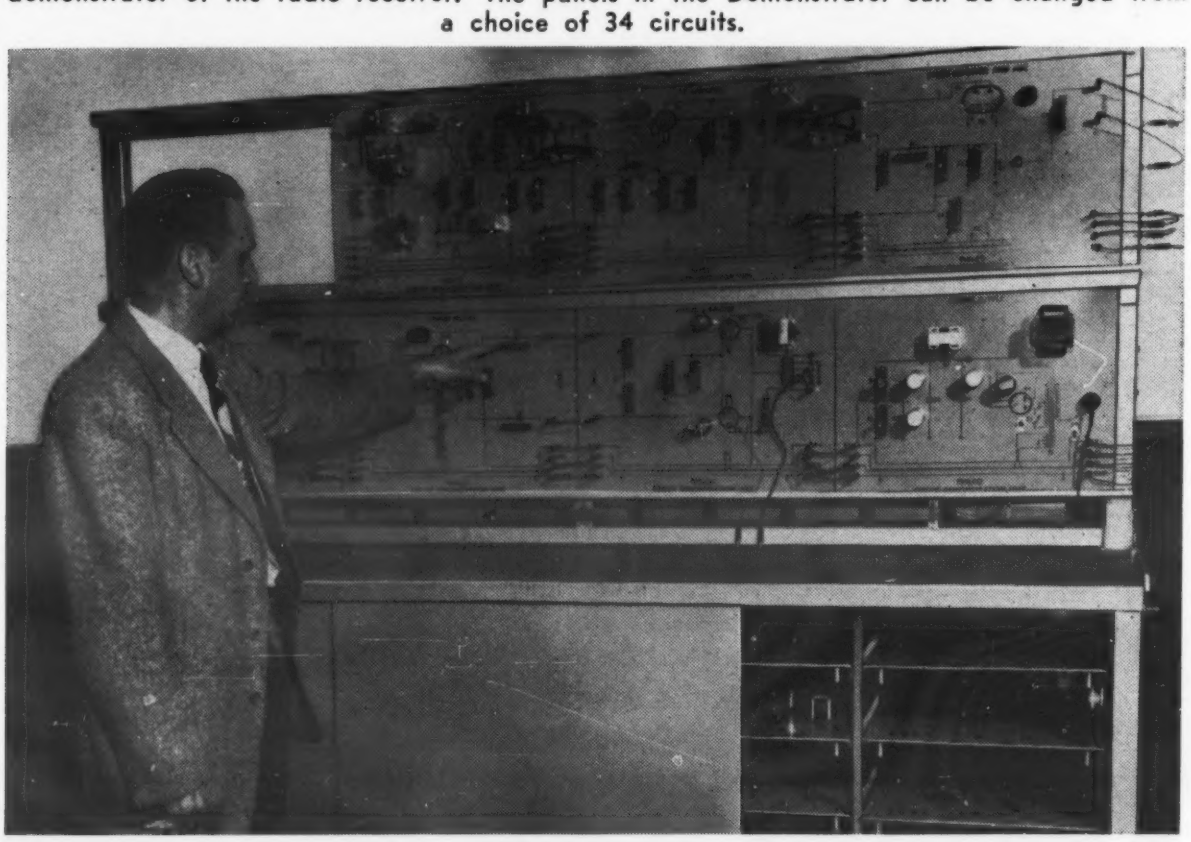
Originally designed to assist the Philco Field Engineer in presenting a standardized program of training in his field assignment, the materials caught the attention of Navy people about a year ago. Philco was asked to develop their prototypes for military use, and, as a result, the Navy's Bureau of Ships became Philco's first customer. The current success of this venture is evident because, in order to conduct their expanding training programs, BuShips has sent Philco a second large order. Philco is now supplying these materials to the Army, Navy, and Air Force as well as to industrial customers.

Today's streamlined demonstration units and kits have come a long way from the less highly developed materials used in early training programs at the TechRep Division. Indeed, Philco has gone a step further in completing a salable item. An entirely new electronics course has been written around the training materials resulting in today's three-dimensional electronics training program. In addition, further refinements are being worked out in the Research and Development Section, Technical Department. This group works closely with the Engineering Department of Philco's Radio and Television Divisions to develop the program technically. In the Engineering Department, the training materials undergo further investigation to see that they meet with Philco's requirements. Then necessary specifications, blueprints, and other data must be issued before Philco can go into the production stage.

Services other than BuShips were quick to recognize the desirability of using Philco's handsome demonstration units, circuit analysis chassis, and fundamental units in their own training programs. To date, the Philco "order book" includes an impressive number of purchasers who are finding their training of technical personnel greatly improved. Philco units are now used by the Army Ordnance Corps at Aberdeen Proving Ground, Maryland; the Frankford Arsenal, Philadelphia, Pennsylvania; and the Redstone Arsenal, Alabama. Other successful users are the Signal Corps and the U. S. Marine Corps. The Lockheed Aircraft Corporation, the Bureau of Aeronautics, and the AA and GM School at Fort Bliss have all purchased these training materials.

In many cases, Philco furnished the services of technically trained personnel, familiar with Philco training methods and the construction and use of these Philco-designed equipments. AMC at Wright-Patterson Field, Dayton, Ohio, has also purchased a large quantity for use at numerous Air Force installations. From the far North, Philco received orders from the Canadian Department of Defense Production for electronics training programs to be conducted by the Royal Canadian Air Force at Clinton, Ontario. Philco Field Engineers are on assignment with this group. Inquiries have also arrived from foreign countries which are interested in obtaining these Philco-designed products to aid them in future training programs of their armed services.

An instructor points out the signal path in the phase splitter circuit during a classroom demonstrator of the radio receiver. The panels in the Demonstrator can be changed from a choice of 34 circuits.



Standardized training aids originally designed by PHILCO to assist their Field Engineers are now being used by the Armed Forces to expand their training programs.

Outside of BuShips, BuAer, and AMC, orders have been for token quantities for evaluation. Philco anticipates that after this evaluation has been completed, these experimental users will place additional orders.

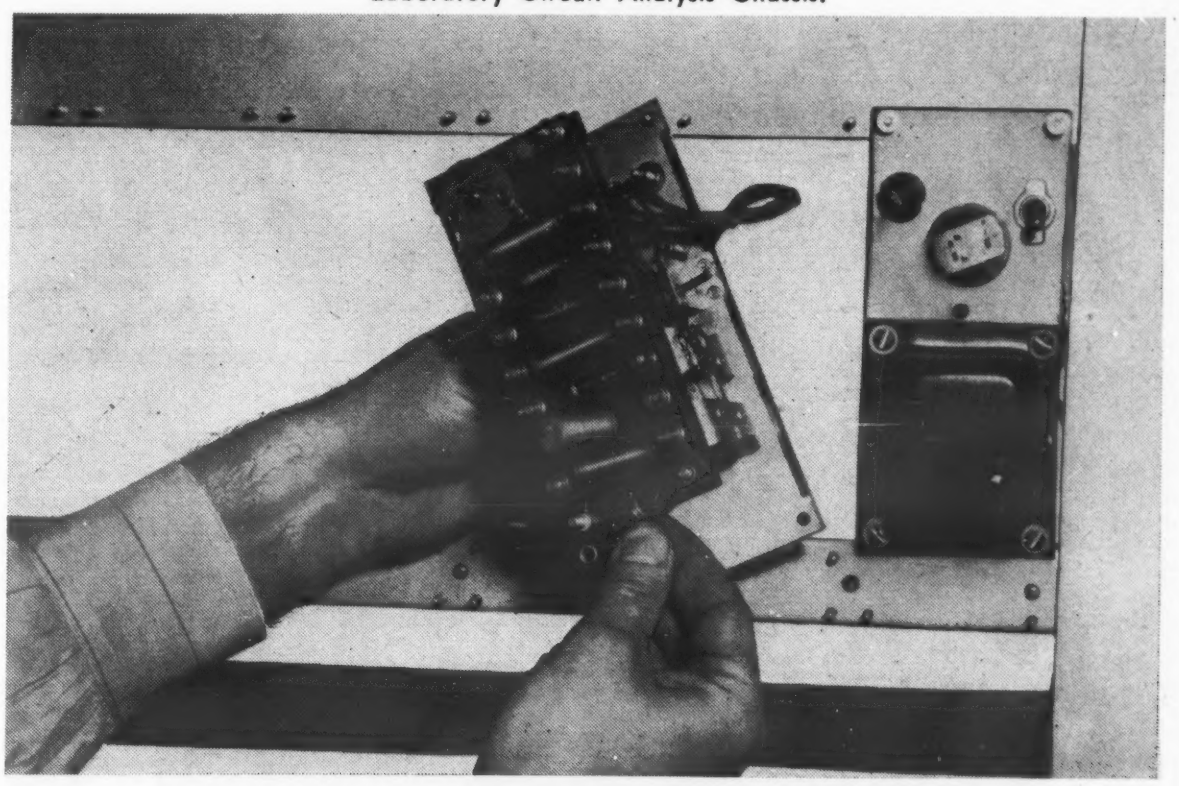
In order to produce these training materials fast enough to fill current requirements, Philco has subcontracted the work to a Midwestern concern whose engineering personnel work closely with a Philco technical group. So thorough was the early planning and threshing out of production problems with this company, that Philco has found it an easy task to continue close supervision. Moving to another geographic area, we find that Philco was instrumental in setting up Philco Corporation of Canada, Limited, now manufacturing Philco training materials. The TechRep Division was largely responsible for securing a contract from the Department of Defense Production, Canada, for training materials to be manufactured at the Canadian plant. The Canadian Navy, which has sent queries, would also be supplied from Philco Corporation of Canada, Limited.

In recent months Philco has signed a contract with BuShips to manufacture a similar type of training materials for sonar equipments and synchro demonstration units. Philco has already completed the engineering stages, and, by November, expects to build demonstration units and chassis in time for a December delivery date. The French Navy has also expressed interest in procuring training materials for sonar equipments and synchro units.

Philco training materials consist of three major components. The four Fundamental Units are used by the trainee as well as the instructor in studying the more elementary aspects of electronic equipment. The Lecture Demonstration Units are individual operating electronic units, with each changeable circuit component mounted next to its symbol on the schematic printed into the yellow baked-enamel finish. This eye-easy, scratch-proof finish is easily viewed from every part of the average classroom, holding the attention of the student and providing a far superior method of studying complicated electronic equipment than used heretofore. These units are displayed in an upright position on the upper level of the Lecture Demonstration Unit Rack, which is designed with ample lockable storage space below. The Circuit Analysis Chassis is used by the student in the laboratory for a more detailed study of the individual electronic circuits and an unlimited combination of circuits following classroom lectures on the Lecture Demonstration Unit. The 34 chassis, which are built on compact steel panels, may be used to represent many types of electronic systems, and the student can study them individually or collectively. In both Lecture and Laboratory units, the circuit components are readily removable and replaceable so that various values may be inserted to enable the student to observe the circuit operation under optimum as well as sub-optimum conditions. A supply of defective parts enables the instructor to teach trouble-shooting techniques effectively and thoroughly. In addition to all of this equipment, Philco has compiled complete Accessory Kits to be used in conjunction with the units described.

Training manuals for both instructors and students are provided for use with the Philco training materials. Prepared in four volumes, they cover Instructor's Manual for Basic Electronic Circuits and Systems, Student's Laboratory Manual for Advanced Electric Circuits and Systems, Instructor's Manual for Advanced Electronic Circuits and Systems, and Student's Laboratory Manual for Advanced Electronics.

The student learns by doing, using the readily removable circuit components of the Laboratory Circuit Analysis Chassis.



From the President

President Watts stresses the fact that one of the primary duties of individual members and the chapters of AFCA is to keep the public informed of the important part played by industry in the military program and the national progress.

In reviewing recent issues of SIGNAL and the activities of the Association over the past several months, I was again impressed by a theme that I have briefly touched upon in conversation with many of our members. Briefly stated it is this: public acceptance of the importance that electronics, communications, and photography have assumed as prime military factors depends directly on the public's understanding of the subject. And this acceptance, as in all things in our National life, is a necessary prelude to public support.

The Congress in turn, acting as a mirror of public opinion, will foster and encourage these industries and arts to the extent that the public demands.

These facts place on the Association a double obligation: not only must it keep its immediate membership, both civilian and military, informed of the activities in its field of interests and foster their mutual relationship, but it must also take every possible opportunity to educate and enlighten the public on these subjects.

That National progress has been made in this matter is well evidenced by the research grants made to date for communications, electronics, and photography. However, the constant expansion of these activities in the military sphere and the increasing sums being spent therefor indicate the desirability of further governmental support for the future development of these arts. Further, it would appear appropriate, particularly in the field of electronics, to have their over-all importance recognized by the establishment of senior authorities, in the various governmental bodies, having cognizance of the entire field of activity. It is here that an informed and understanding public opinion must play its part, and it is the Association's obligation to do what it can in furthering public thought on the subject. SIGNAL is, of course, an excellent medium for this purpose, but it must be supplemented to the greatest possible extent by the activities of the Local Chapters so that the message of the Association may reach the widest possible public. While the Local Chapters have made commendable progress in this matter, I think there still remains a real opportunity for energetic action.

As these lines are written, preparations are going forward rapidly for the coming Annual Convention. A splendid program is being arranged, and I am sure it will be of real interest and benefit to all of us. I hope to see you there.

Association Affairs

Principal speakers who participated in program sponsored by Philadelphia Chapter of the Armed Forces Communications Asso. to enable Air Force to interpret procurement program to small business are (left to right): Col. D. L. Rundquist, Philadelphia Air Regional Representative of the U. S. Air Force; Capt. F. W. Parsons, U.S.N., Supervising Inspector of Naval Material; Col. R. G. Swift, president, Philadelphia Chapter, AFCA; W. W. Watts, national president, AFCA; and Brig. Gen. W. Preston Corderman, Commanding General, Signal Corps Supply Agency.

Air Force Film Premiered at AFCA-Sponsored Luncheon

Air Force procurement specialists were enabled to outline their small business program to top level representatives of state, civic and industrial organizations of the Philadelphia area at a luncheon meeting in January, at the Philadelphia Engineers Club under the auspices of the Philadelphia chapter of the Armed Forces Communications Association.

Nearly 100 persons attending the luncheon saw the premiere of a motion picture, "The Air Force and Small Business," which was having its initial showing in 27 cities across the country.

Guest speaker on the occasion was W. W. Watts, national president of the AFCA, who spoke briefly on "Some Aspects of the Relationship Between Large and Small Business in Present Defense Production Efforts."

"AFCA is happy to sponsor this affair as a practical step in its over-all program of maintaining and improving the cooperation between the Armed Forces and industry in the design, production, maintenance, and operation of communications, electronic, and photographic equipment in time of peace as well as in time of war," Mr. Watts declared.

Colonel D. L. Rundquist Philadelphia Air Regional Representative of the U. S. Air Force, opened the meeting by stating the themes as, "There is No Business Like Small Business." "The twofold object of the nation-wide meetings being held to premier the new picture," he said, was to restate the Air Force small business program to these groups, and to invite their aid in helping the Air Force contact all small business firms qualified to do Air Force work.

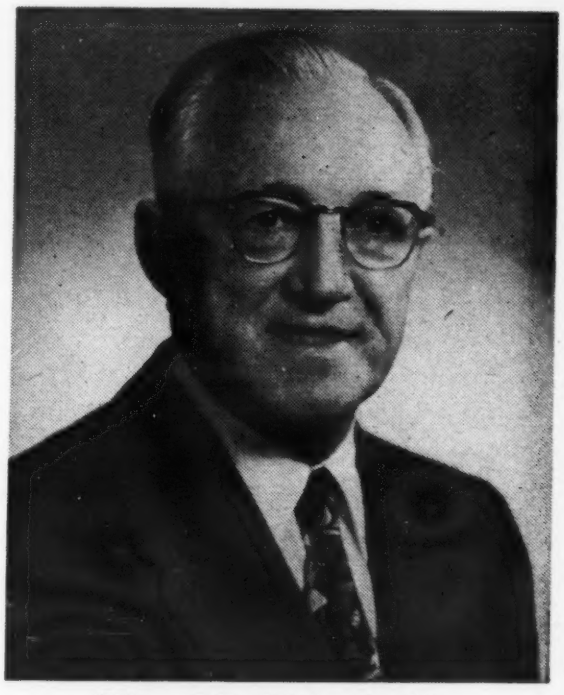
"By bringing its regional small business activities right into a local community at grass root level, the Air Force believes that it cannot only offer immediate help to many small business men but can also build up a valuable source of potential suppliers to which the country could turn in the event of total mobilization," said Col. Rundquist.

He emphasized that he would like organizational heads attending the meeting to arrange for future showings of the film to their member components in various cities, towns, and communities under the jurisdiction of the region. Business specialists in the Air Force Procurement agencies will be glad to attend these showings to answer questions and speak on the procurement program. The 22 minute sound film is designed to show the small business man how to seek Air Force business with a minimum of time, money and effort.

Teletype Inventor Honored

Edward E. Kleinschmidt, founder and president, Kleinschmidt Laboratories, Deerfield, Illinois, and inventor of Teletype and the new portable Teletypewriter, was awarded a Special Citation by the Chicago AFCA chapter, for "his distinguished contributions to the progress of civilian and military communications—particularly in the field of printed, electrically transmitted messages."

The Citation points out that "for 55 years Kleinschmidt has been tireless in his efforts to advance the art of civilian and military communications," and that "his own capacity for inventiveness and clear thinking has enabled him to develop the picture telegraph (1900); railway signalling devices (1910); the printing telegraph apparatus (1912) which later became known as Teletype: and the new light-weight high speed Teletypewriter for the Armed Services of the United States (1945).



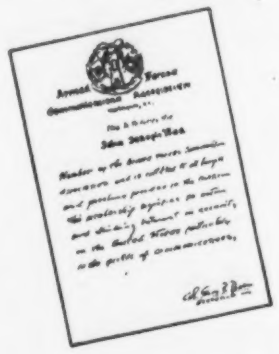
Edward E. Kleinschmidt

New Air Force Orders

Recent orders from Air Force Headquarters include the appointment of Maj. Gen. Raymond C. Maude, former Director of Communications, USAF Hdqrs., to the post of Deputy, Commanding General of the Air Force Cambridge Research Center at Cambridge, Mass. General Maude is one of the vice-presidents of the AFCA.

Succeeding General Maude as Director of Communications is Brig. Gen. Gordon A. Blake. General Blake has been associated with Air Force communications since gradu-

AFCA Insignia



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ASSOCIATION AFFAIRS

ating from the Signal School at Fort Monmouth in 1935. Colonel Alvin L. Pachynske has been appointed Deputy Director of Communications, USAF Hdqrs.

IRC Founder Receives Honor

Dr. Harold Pender, outstanding inventor, and founder of the International Resistance Company, Philadelphia, was admitted as Eminent Member into Eta Kappa Nu Association on January 19, 1953 in recognition of his technical attainments and contributions to society through outstanding leadership in the Profession of Electrical Engineering.

Author of "Pender's Handbook," and well known as former dean of the Moore School of Electrical Engineering, University of Pennsylvania, Dr. Pender is also a member of IRC's Board of Directors and head of its staff of consultants.

New Commands for Gen. Reichelderfer and Col. Lyman

Gen. Reichelderfer

Col. Reginald P. Lyman, former chief of staff at Fort Monmouth, has succeeded Brig. Gen. Harry Reichelderfer as commanding officer of Camp San Luis Obispo, Calif. General Reichelderfer left the Signal Corps Replacement Training Center and the Southwestern Signal School to assume his new position as Chief of the Army Security Agency in Washington.

Colonel Lyman is the second commander at the west coast Signal Corps installation since its activation in December 1951. General Reichelderfer was appointed the first commander of San Luis Obispo, after serving as commanding general at Fort Monmouth from April to December 1951.

Convention Notes

Arrangements for our annual convention, which is to be held at Dayton, May 14, 15 & 16, insure an outstanding affair. Paul Clark, president of the Dayton Chapter, our host chapter this year, claims that this convention will undoubtedly be the best one to date.

Preliminary registration forms are being mailed out to all AFCA members, and the final forms will then be sent to those who have indicated that they expect to attend all or part of the convention.

All-inclusive cost for registration and the various events is $19.50. For your information, we are showing below the schedule of the main events.

May 14		*May 15*	
9:00 AM	Registration	9:30 AM	Registration
10:00 AM-12 N	Chapter Presidents' Meeting	9:30-11:00 AM	Council and Directors' Meeting
12:30-2:00 PM	Keynote Luncheon	11:15 AM-3:15 PM	Lunch and Demonstration at Wright-Patterson AFB
2:30-4:30 PM	Open Forum		
6:00-7:00 PM	Cocktail Party	6:30 PM	Cocktail Party
7:00 PM	Buffet Supper & Dance	7:30 PM	Banquet

May 16 9:00 AM Special breakfast meeting of National Directors with new National Officers

Ladies are especially invited and a special program is being arranged for them by the Ladies' Convention Committee, headed by Mrs. Jesse Walden.

You will not want to miss the fine show which is being put on for us by the Air Force at Wright-Patterson AFB. Send in your preliminary registration card before you misplace it!

APPLICATION FOR MEMBERSHIP

ARMED FORCES COMMUNICATIONS ASSOCIATION
1624 Eye Street, N. W. Washington 6, D. C.

NAME: _____
(Last Name) (First Name) (Middle Name or Initial)

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Business Affiliation
or Employer: _____ Position _____

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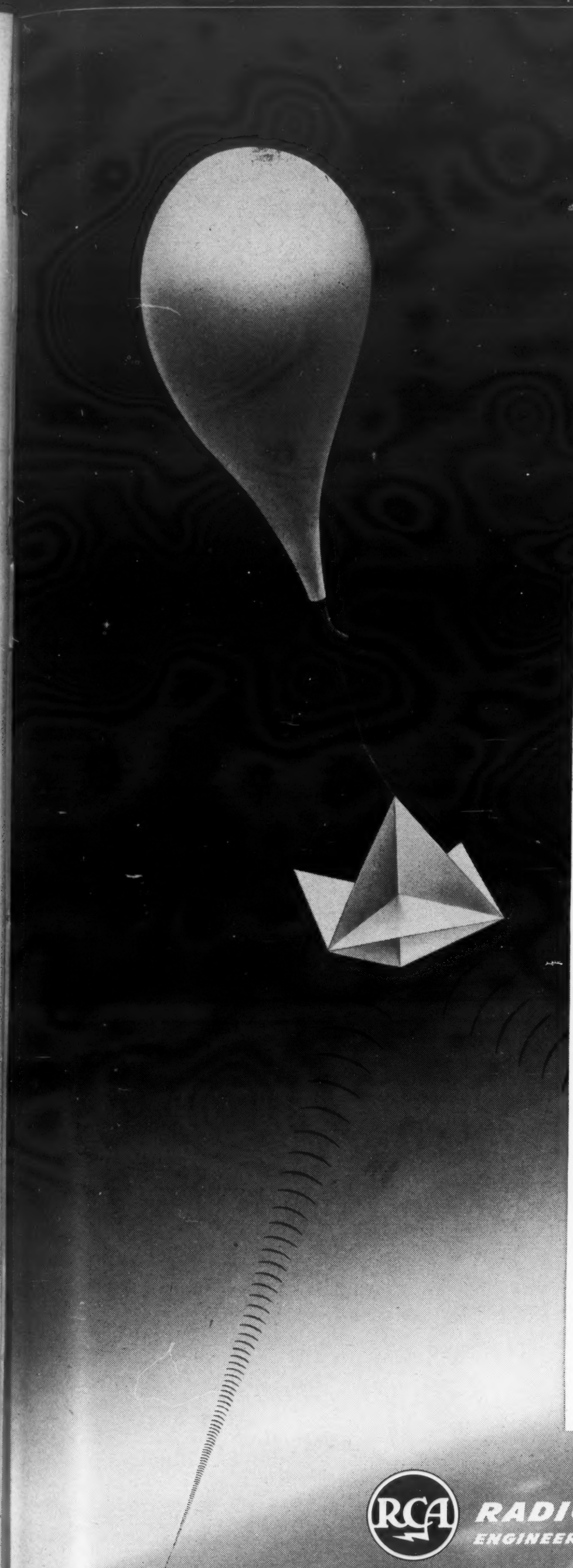
Component: Army ☐ — Navy ☐ — Air Force ☐ — Marines ☐ — Civilian ☐
Coast Guard ☐ — National Guard ☐ — Merchant Marine ☐

Branch: _____ Rank or Grade: _____

Type of Membership desired: Full—$5.00 ☐ Student—$2.00 ☐ Life—$100.00 ☐
I am a citizen of the U.S.A.. Enclosed find $_____ for annual dues for AFCA membership, which includes subscription to the bi-monthly magazine SIGNAL.

DATE: _____ SIGNATURE: _____



Which way's the wind blowing?

YOU CAN'T TELL—if you try to track this balloon. Because it's drifting at 40,000 feet—out of sight and beyond the range of optical tracking systems! But a new radar, developed by RCA for the military, can clearly "see" the balloon in any weather—track it accurately—tell how high it is—show how fast it's moving. *Result: Exact wind direction and speed information at specific altitudes!*

Here's how the system works. A free balloon carrying a radar reflector is released. The new RCA ground radar follows the balloon as it rises and drifts with the wind. Signals are reflected back to the radar—accurately directing the movement of the pedestal that feeds data to an electronic computer. From this equipment, wind velocities at specific elevations are presented on teletype to be read on the site, or at some remote point. *All this automatically—and with greater economy than with previous systems!*

"Wind intelligence" like this makes accurate weather forecasts possible—days in advance. It is invaluable in aiming heavy artillery and in directing long-range aircraft and guided missiles! Just one example of how RCA research and applied engineering helps provide our Armed Forces with better electronic equipment. By all means get acquainted with the RCA engineers and field technicians in your Branch of Service.

RCA **RADIO CORPORATION of AMERICA**
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.

7th AFC Conve

May 14-15-16

An outstanding program has been prepared for all. Hurry and send in your registration forms.

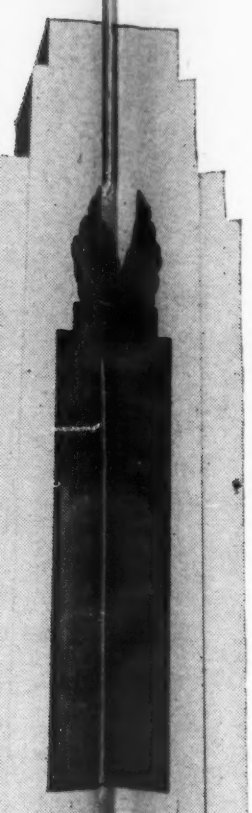
Aerial Photo of the City of Dayton Ohio

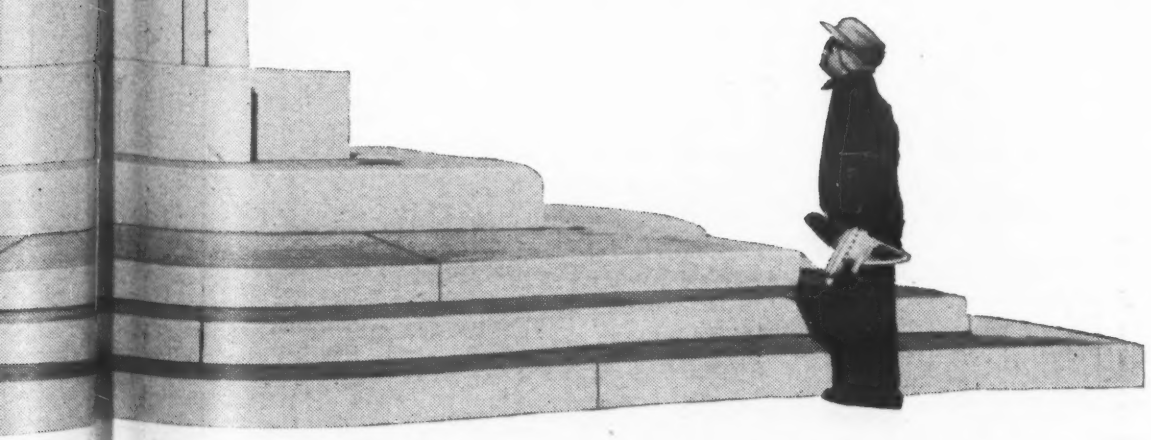
The Orville and Wilbur Wright Monument, Dayton, in

7th

FCA

vention

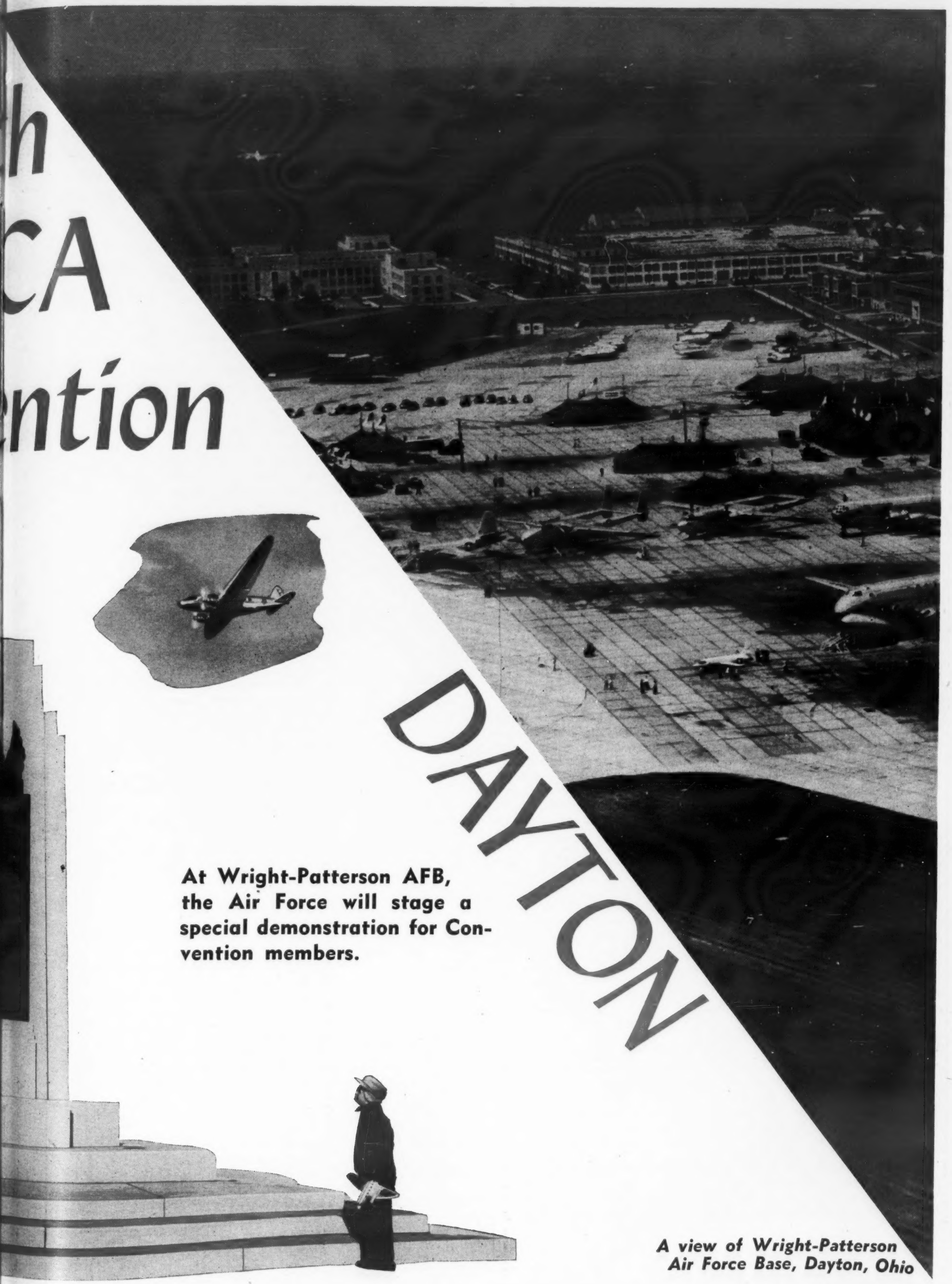




ent, Dayton, in memory of their famous native sons.

At Wright-Patterson AFB, the Air Force will stage a special demonstration for Convention members.

DAYTON



A view of Wright-Patterson Air Force Base, Dayton, Ohio

AFCA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Ampex Electric Company
Acme Telectronix
Admiral Corporation
Allied Radio Corporation
Almo Radio Company
Altec Lansing Corporation
American Cable & Radio Corp.
American Electroneering Corp.
American Institute of Electrical Engineers
American Phenolic Corporation
American Radio Relay League
American Telephone & Telegraph Co.
Anaconda Wire & Cable Company
A. R. F. Products, Inc.
Andrews Corporation
Argus Cameras, Inc.
Arnold Engineering Company
Audio Products Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bendix Radio
Bergsma Brothers
Bliley Electric Company
Breeze Corporation
Burnell & Company
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Inst., Inc.
Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
Central Radio and Television Schools
Chesapeake & Potomac Tel. Co.
Churchill Cabinet Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Corning Glass Works
Croname, Inc.
Crosley Division-Avco Mfg. Corp.
De Vry Corporation
Diamond State Telephone Co.
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
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Federal Telephone & Radio Corp.
General Aniline & Film Corp.
General Cable Corporation
General Communications Co.
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Hoffman Radio Corp.
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Hycon Manufacturing Company
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Indiana Bell Telephone Co.
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Indiana Steel & Wire Co.
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International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
James Knights Co., The
Kellogg Switchboard & Supply Co.
Kester Solder Company
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Lavoie Laboratories
Leich Sales Corporation
Lenkurt Electric Company, Inc.
Lenz Electric Manufacturing Co.
Lewyt Corporation
Loral Electronics Corporation
Machlett Laboratories, Inc.
Magnavox Company
Majestic Radio & Television, Inc.
Mallory, P. R., & Co., Inc.
Merit Transformer Corp.
Michigan Bell Telephone Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.
Muter Company, The
National Cash Register Co.
National Company, Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Pacific Mercury Television Mfg. Corp.
Pacific Telephone & Telegraph Co.
Philco Corporation
Photographic Society of America
Pickering & Company, Inc.
Pioneer Electric & Research Co., The
Platt Electronics Corporation
Precision Apparatus Co., Inc.
Radiart Corporation
Radio Condenser Company
Radio Corporation of America
RCA Victor Division
Raymond Rosen Engineering Products, Inc.
Ray-O-Vac Company
Raytheon Manufacturing Company
Reeves Instrument Corp.
Remington Rand, Inc.
Robco Mfgr. Division Pilot International Corp.
Saxonburg Potteries
Seeburg, J. B. Corporation
Sherron Electronics Co.
Shoup Engineering Company
Simmon Brothers, Inc.
Society of Motion Picture Engineers
Sonotone Corporation
Soundscriber Corp.
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sperry Gyroscope Company
Sprague Electric Company
Stackpole Carbon Company
Standard Coil Products Co., Inc.
Standard Piezo Co.
Standard Transformer Corp.
Stewart-Warner Corporation
Stromberg-Carlson Co.
Stupakoff Ceramic & Mfg. Co.
Sylvania Electric Products, Inc.
Technicolor Motion Picture Corp.
Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Trav-ler Radio Corp.
Tung-Sol Lamp Works, Inc.
United States Rubber Company
United Telephone Co.
Utah Radio Products Co., Inc.
Voltz Brothers, Inc.
Waterman Products Co., Inc.
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West Coast Telephone Co.
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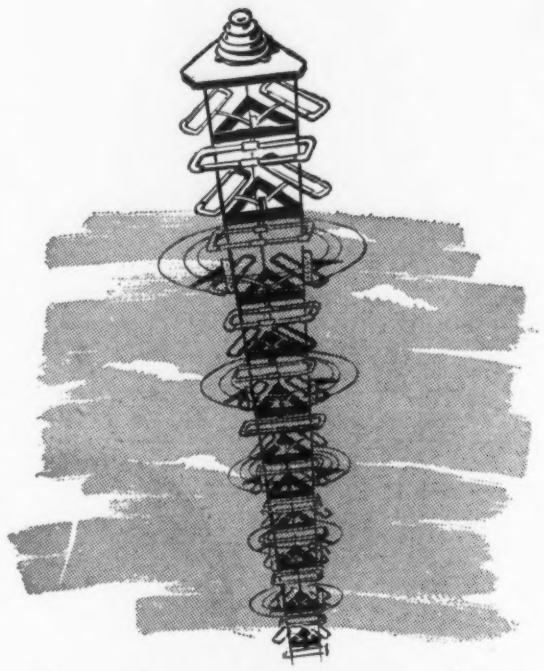
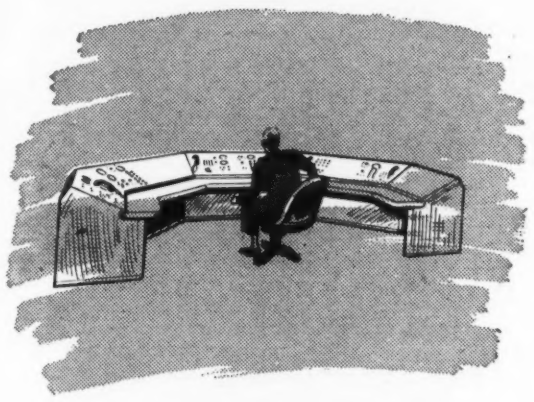


Transmitters, antennas, complete telecasting installations.



Studio equipment, control consoles, monitors.

WITHIN THE NEXT DECADE television will grow beyond all present-day conceptions. International Telephone and Telegraph Corporation is ready to help speed the new industry on its way—ready with new transmitters of advanced design, improved studio equipment, high-gain antennas, microwave links for studio-to-transmitter and mobile pick-up—and ready with the finest instrument for home entertainment, the incomparable Capehart. Look to IT&T, together with its associate companies, for tireless effort in television development.

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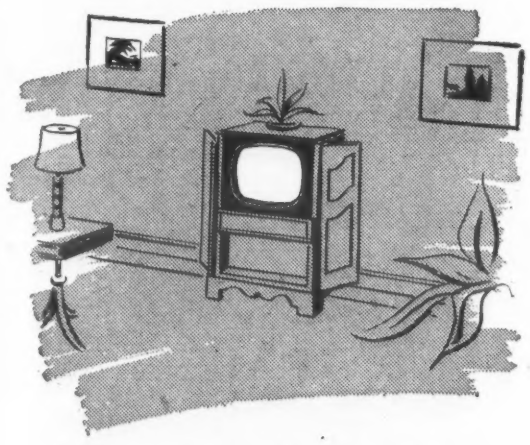
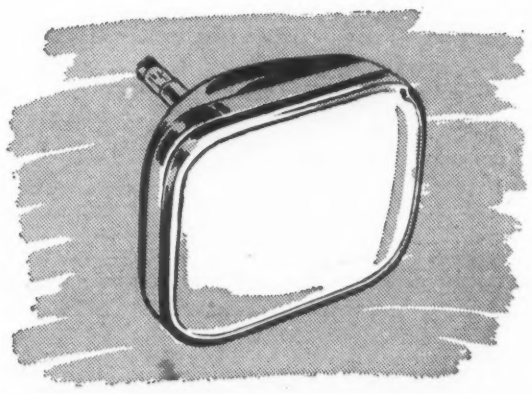
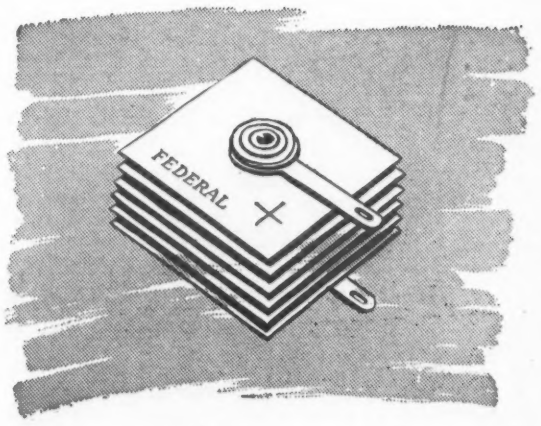


The incomparable Capehart home television receiver.



Television picture-tubes for Capehart and other TV manufacturers.



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Chapter News

Augusta-Camp Gordon

The Southeastern Signal School presented an interesting demonstration of Army aircraft radio equipment at the chapter's December 17th meeting. Sgt. Roger W. Wolf, an instructor at the school, assisted by Sgt. Richard C. Eberle, described and demonstrated the ARC Type 12 communications equipment, the Lear ADF-14, automatic direction finding equipment, ARC Type 15, navigation recurring equipment, the aircraft radio range, and the omnirange navigation systems. The equipment displayed was selected from the regular training aids used to instruct radio repair students in the Signal School.

Col. George Dixon, AFCA Executive Secretary, reported on the overall activities of the association and complimented the chapter on its standing in the current Chapter of the Year contest.

New officers were unanimously elected as follows: honorary president—Brig. Gen. Robert A. Willard; president—Lt. Col. Fred J. Elser; vice-presidents—John Owen, Maj. Joseph P. Sahm; secretary-treasurer — Lt. Col. Harold C. Williams; directors — Col. John V. Tower, Charles M. Eberhart, Jesse Willard, G. M. Sweeney and Lt. Col. Bertie L. Avera; committee chairmen—Col. Louis J. Tatum and Ray Ringson.

A lecture-demonstration on the history and scientific research of modern video by Dr. Maurice E. Strieby, American Telephone and Telegraph Company's technical demonstrations director, featured the January 28th meeting. Staged in Theater No. 1 of Camp Gordon, the lecture was open to the public and drew a capacity audience.

Starting with the basic but simple principles of television, and using a working model of the first crude video system patented in Germany in 1884, Dr. Strieby traced the history of today's most popular form of entertainment. He also described the steps by which better picture detail has been achieved during the years of research and experimentation.

Television transmission and the interchanging of light and radio beams constituted a major part of the program. Dr. Strieby discussed the two methods of transmitting TV pictures from city to city and the differences between and the advantages of the coaxial cable and radio-relay systems. He exhibited samples of coaxial cable and intermediate repeater or "booster" amplifiers, and, using miniature transmitters and receivers, demonstrated various properties of light and radio beams to explain the behavior of the radio-relay facilities.

Dr. Strieby concluded his program with a summary of some of the challenging problems Bell engineers and scientists overcome in the design and construction of telephone and television networks from coast to coast.

1953 Chapter of the Year Contest

Chapters in the lead on January 31st were:

	POINTS
Augusta-Camp Gordon	31.30
Decatur	25.45
Pittsburgh	17.93
Dayton-Wright	17.75
New York	15.59
Seattle	14.98
Boston	14.26
Chicago	13.33
Baltimore	12.69
South Carolina	12.54

Baltimore

The Bendix-Friez Instrument Division, Bendix Aviation, was host to the chapter for its January 13th meeting. Members were given a comprehensive picture of the operations of Bendix-Friez and were then conducted on a tour of the plant.

The chapter was welcomed by L. D. Kiley, General Manager of Bendix-Friez, who gave a short resume of the plant's operations. Mr. V. B. Hauck, Factory Manager, recounted the history of the Bendix-Friez Instrument Division and then went on to discuss the radiosonde, its best known piece of equipment. He described it as a highly developed device dealing with the operation and activities of rockets, MATS, weather forecasting, etc., which makes it possible to determine wind velocity, air temperature, humidity, ice crystals, turbulence, etc. The radiosonde consists of transmitters operating up to 1700 megacycles but in the future the company hopes to reach higher frequencies. Mr. Hauck also discussed the resistors manufactured by Bendix-Friez which are sensitive to humidity.

Mr. D. J., Fausnaugh, Director of Industrial Relations, instructed the group on the highlights of the tour which followed.

Dinner was served in the plant cafeteria, with 125 members and guests present. During the meeting, Mr. F. W. Godsey, Jr., Manager, Electronics Division, Westinghouse Electric Company, invited the chapter to hold its February meeting at the Lansdowne plant of Westinghouse. Chapter President George Ruehl reviewed the aims and purposes of the association for the benefit of the guests present and reminded members of the national convention being held in Dayton in May, urging maximum attendance.

The following organizations were represented at the meeting: Baltimore Signal Depot; Bendix-Friez; Bendix-Radio; Westinghouse Electric; Chesapeake & Potomac Telephone Company; the U. S. Naval Experimental Station; Baltimore News-Post; Aircraft Research; Charles Antell; and Glenn L. Martin Company, which was represented by Dr. Schutz, Director of Electronic Circuit Design, and Mr. Schotte, Supervisor, Special Weapons Unit.

Baltimore Chapter toured the communications center at Maryland State Police Headquarters in December. At left, members watch police messages coming through on teletype machines; and, right, Capt. W. H. Conroy demonstrates a Handie-Talkie used by the police.

At Chicago Chapter's January 30th meeting, l to r: William C. DeVry, vice-pres.; Col. T. R. Horn, signal officer, Fifth Army; James H. Kellogg, president; Edward E. Kleinschmidt, pres. of Kleinschmidt Laboratories where the meeting was held.

Boston

Rear Admiral William B. ,Ammon Director, Naval Communications, discussed "Naval Communications in New England" at the January 22nd meeting of the Boston Chapter.

Citing some of the early developments in Navy communications which took place in New England, such as submarine signalling in 1898, radio communications in the early 1900's, the radio controlled torpedo in 1916, etc., Admiral Ammon went on to point out the extensive participation in Navy communications in the same area today. As examples, he mentioned the five major centers of Navy activity in New England which have their own radio stations and require extensive landline service; the Naval shipyards which use large quantities of electronics equipment; the 29 Naval Reserve Training Centers which have completely equipped radio stations and are engaged in training electronics personnel; the six NROTC units at New England colleges and universities which are turning out many commissioned officers assigned to communications-electronics duties.

He stated that some 400 New England firms are engaged in supplying the Navy's needs in the field of electronics. In electronic tubes, New England industry has produced a large quantity of standardized tubes and developed techniques for manufacturing special tubes. He also said that tube manufacturers in the area have made valuable contributions to the development of crystal rectifiers. Referring to the Office of Naval Research contracts at M.I.T. and Harvard University, he stated that much work is being done to develop traveling wave tubes and special magnetrons for VHF and UHF in applications where considerable power is required.

"Although the pioneer days in communications are over," concluded the Admiral, "New England's future offers bright prospects for both science and industry in the field of electronics. The Navy expects to share largely in New England's electronic future."

The dinner-meeting was held at the Boston Naval Shipyard, with ninety members and guests present. Admiral Ammon was introduced to the membership at a social hour which preceded the meeting. Capt. R. D. Gold, USN, and Capt. J. A. Callaghan, USN, were special guests of the chapter.

The speech on "Trends in the Electronics Industry from a Government Viewpoint" given by Richards W. Cotton, chairman, Electronics Production Board, DPA, at the November meeting of the chapter has been reproduced with his permission by the Franklin Technical Institute and distributed to all members and guests of the Boston Chapter.

Chicago

The pre-holiday meeting of the Chicago Chapter was held December 11th at the Officers' Club of Fifth Army Headquarters. Co-featured on the program were talks by Lt. Col. Louis V. Germain, officer in charge of Signal Corps supply operations in the Mid-West, and William Spanke, communications specialist of Fifth Army Headquarters . Host to the meeting was Col. T. R. Horn, Signal Officer of the Fifth Army.

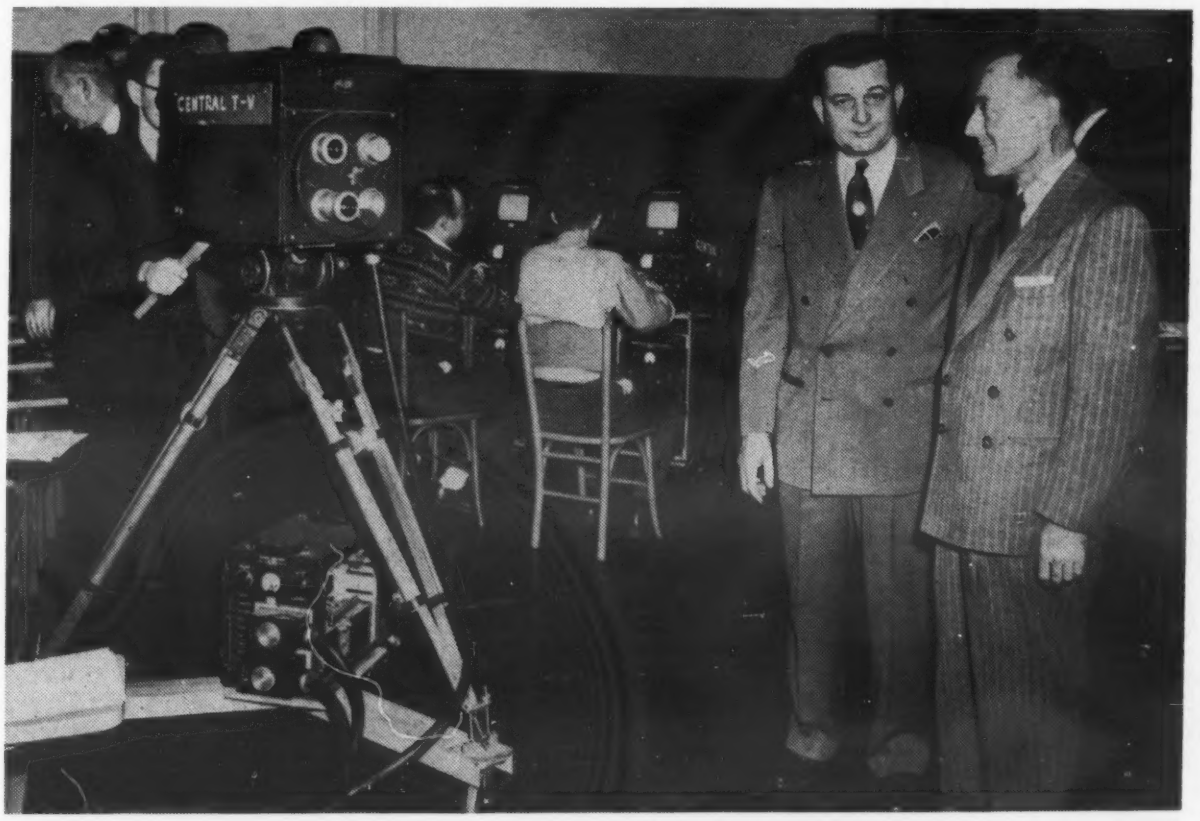
Col. Germain, who is in charge of Signal Corps procurement in 21 states, outlined the contract and industrial service functions of the Signal Corps office and introduced several of his key personnel. He stated that some 3,700 contracts are currently being handled in this district, with a dollar value of some 600 million. He recalled that a great deal of useful liaison with industry had resulted from the chapter meeting at Fifth Army last year.

In introducing William Spanke, whose subject was the operation of the automatic teletype switching center developed at Fifth Army in a joint military-industrial project, Col. Horn stated that the equipment had been cut into operation November 22nd to take the full Fifth Army traffic of 15 teletype lines. He informed the group that Lt. Gen. William B. Kean, Commanding General, Fifth Army, had made two awards in connection with the successful project—the Army commendation ribbon to Mr. Spanke who had coordinated the project, and a certificate of achievement to Maj. Howard P. Donovan of Fifth Army headquarters who was instrumental in the development.

Mr. Spanke described the complicated operation of the 25-line automatic teletype switching center, demonstrating the way in which signals were handled by use of an illuminated block diagram built for instruction purposes by Automatic Electric Company, manufacturer of the switching equipment that required three years to develop. He showed the paths by which incoming messages were switched cross-office, recorded and monitored, with possible interruption imposed by six different degrees of precedence. After showing the sequences for different operation, Mr. Spanke presented some illustration slides giving views of the actual equipment, complete with alarm lights and gongs to indicate every conceivable threat to perfect operation.

The meeting was climaxed by a tour of the headquarters to see the manual and the automatic teletype switching centers, and compare old and new in actual operation. Members and guests formed into small groups to observe the equipment under regular traffic load. Comment was most enthusiastic about the many improvements intro-

Kansas City Chapter toured the Central Radio and Television Schools on January 19th. At the right are H. M. Botkin of the AT&T Co. and C. L. Foster, president of the school.



duced in the automatic switching, accomplished in its relatively short period of development.

One hundred fifty members met at the Kleinschmidt Laboratories in Deerfield on January 30th for a dinner-meeting and a tour of the laboratories. During the meeting, Chapter President James H. Kellogg awarded to Edward E. Kleinschmidt, founder and president of the laboratories, and inventor of teletype and the new portable teletypewriter, a special citation by the Chicago Chapter for "his distinguished contributions to the progress of civilian and military communications—particularly in the field of printed, electrically transmitted messages." (Reported elsewhere in this issue.)

Prior to the conducted tour of the plant where the teletypewriter is in production, the AFCA group was shown a film in color, "The Portable Teletypewriter," showing the development of the new equipment, its manufacture in the Kleinschmidt Laboratories, and its effective use by the Armed Forces in Korea and other areas.

A reception preceding dinner honored Mr. Kleinschmidt and distinguished guests.

New York Chapter meeting at AT&T Long Lines Dept. hqs. Shown at top: Herbert J. Schroll, featured speaker, and T. L. Bartlett, chapter president. Above, members participate in two Bell System exhibits: the one at left, "How the Telephone Warns of Enemy Attack," depicts each step in attack warning; and the exhibit at right presents a comparison of long distance dialing by operators and users.

Dayton-Wright

An enjoyable cocktail party at the Miami Hotel on December 18th marked the chapter's observance of the holiday season. Being entirely a social affair, no business meeting was held, although plans were briefly discussed for the coming annual convention in May at which the chapter will act as host.

An illustrated lecture on "Application of Electronics to Photography" by Major Frederick Crawford of Wright Field, Air Force photography expert, was the program feature of the January 29th meeting at the Biltmore Hotel. In addition, the speaker explained and demonstrated some photographic equipment to support his talk.

The business session was mainly devoted to plans for the forthcoming national convention. Chapter President Paul Clark announced the tentative schedule of events for the three-day annual meeting and the estimated cost. Chapter Secretary Lucille Althoff was appointed treasurer to replace David Pearlstone of RCA who had been transferred to New York.

Detroit

Chapter members met at Selfridge Air Force Base on November 20th for a tour and demonstration of GCA and AACS facilities, followed by dinner at Lakeside House on the base. Arrangements for the highly successful evening were made by Major Paul Stuart, Jr., Hqs. 4708th Defense Wing, Selfridge Air Force Base.

A visit to the Detroit Arsenal for a demonstration of its communication installations and a tour of the tank manufacturing facilities featured the January 29th program. Members and guests met at the Stephenson Club for a cocktail hour and dinner before proceeding to the Arsenal.

Fort Monmouth

The film record of an actual eye operation as transmitted by color television was the highlight of a talk by Dr. Peter C. Goldmark, director of engineering research and development, Columbia Broadcasting System, at the chapter's February 19th meeting.

Dr. Goldmark's subject was "Color Television and Its Uses," and his talk was illustrated with slides in addition to the kinescope of the eye operation, which was prepared by the United States Navy. Considered an authority of world-wide reputation, Dr. Goldmark has long been a leader in the color television field, and the first color telecast in history, so far as is known, took place under his direction. His lecture was accorded an enthusiastic response from the capacity audience.

A cocktail hour and dinner preceded the meeting at Gibbs Hall, Fort Monmouth. Col. Joseph E. Heinrich, new president of the chapter, presided and extended an invitation to anyone interested in any phase of communications, electronics or photography to join the chapter and take part in its activities.

Kansas City

The Central Radio and Television Schools, Inc., a group member of AFCA, was host to the chapter on January 19th. The evening's program, which was followed by a tour of the school training laboratories, included a report on the status of TV broadcasting—national and local—by C. L. Foster, president of the school; a demonstration of TV camera and studio equipment by N. E. Vilander, chief technical instructor; and a talk on industrial and military applications of TV by C. V. Curtis, director of technical publications.

Arrangements for the interesting meeting were made by the school's president, C. L. Foster, who was one of the founders of the Kansas City Chapter.

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GENERAL ELECTRIC General Instrument
hallicrafters Hoffman JACKSON
Magnavox Majestic Meck
MIDWEST Motorola Olympic
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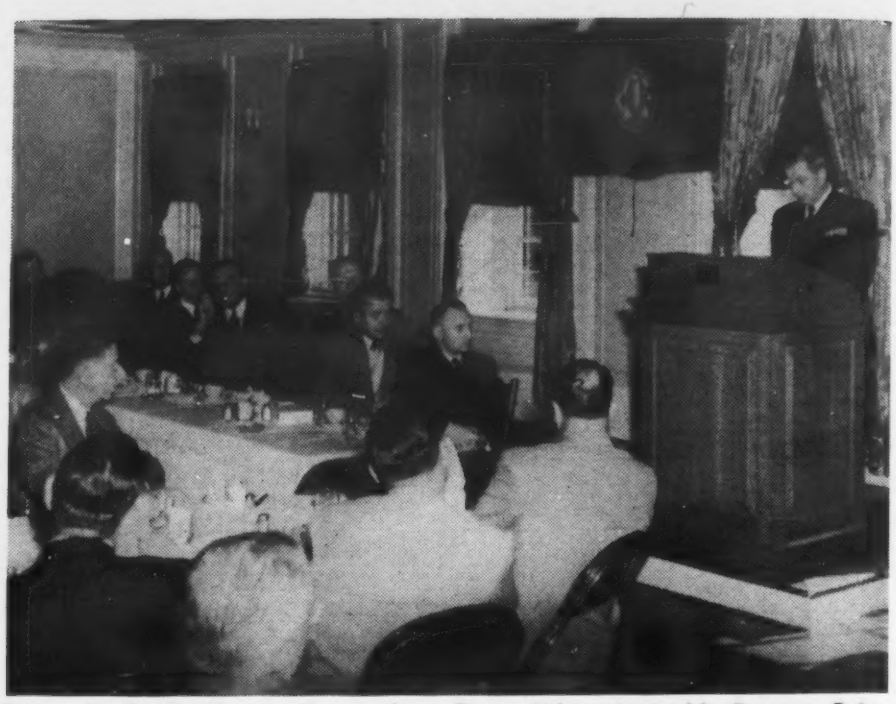


Philadelphia luncheon meeting on February 10th. Shown at left, l to r: Capt. F. R. Furth, guest speaker; Rear Adm. John H. Brown; Brig. Gen. W. P. Corderman and Capt. F. W. Parsons. At right, Capt. Furth addresses the group. Shown in the background is the chapter's new banner.

New York

An informative address on "Communications for Air Defense" by Chapter Vice-President Herbert J. Schroll of the American Telephone and Telegraph Company, followed by special, animated exhibits portraying the Bell System's role in providing communications for defense, highlighted the chapter's December meeting in the auditorium of the AT&T Long Lines Department headquarters building. Before launching into his talk, Mr. Schroll conveyed to the members the chapter officers' appreciation of their support and called for a standing vote of thanks to Col. T. L. Bartlett, retiring chapter president, for his excellent leadership during 1952.

First emphasizing the threat of aggression and the vital importance of an all-out defense effort, Mr. Schroll said the components of the complex, costly air defense of the nation consisted of a comprehensive, coordinated Army, Navy and Air Force military plan; an effective system of air surveillance and intelligence; weapons, including fighter aircraft, guided missiles, and anti-aircraft artillery; well trained and competent personnel; and, last but not least, communications which, he said, function as a nerve center and bind these vital components together.

Mr. Schroll outlined the organization of the Air Defense Command and explained the Ground Observer Corps System, the Filter Center equipment arrangements, "Operation Skywatch," and some of the special practices to insure priority and safeguard the handling of such calls as Aircraft Flash and Air Defense Warnings. He stated the Air Defense Command required extensive communications networks for its radar sites, fighter bases, combat centers, headquarters liaison, and many other locations; also, a rapid, dependable system for alerting military and civil key points of an impending attack. The required tactical networks are provided by the Bell System and independent telephone companies in the form of private line telephone and teletypewriter services which operate on a 24-hour basis.

He also discussed pre-engineered military circuits which can be established quickly—"usually within one hour"—by taking circuits out of the regular message traffic layout to augment normal private line channels for the military should the need arise. This arrangement thus minimizes the cost to the Government and at the same time enables telephone companies to use these circuits for their regular commercial traffic.

Mr. Schroll concluded by saying: "The value of communications to the military is dependent largely on their reliability and availability when most needed. Advantage is taken of alternate routes to give maximum diversification of circuits. While the present average percentage of 24-hour reliability of telephone circuits is high, better than 99.5%, the telephone companies are by no means content. Communications for defense are considered the number one job in the Bell System and we are giving every attention to this service."

A brief talk was given by Mr. J. R. Rae, Engineer of Transmission for the Long Lines Department, who explained some of the functions of the department and cited pertinent statistics. In addition, members were given a verbal picture of the department's efforts to diversify plant facilities to meet emergencies.

Mr. William J. McGrath, Chief of the Aircraft Warning Service for the State of New York, followed with an urgent appeal for volunteers for the Ground Observer Corps. He presented some striking facts about the shortage of volunteers and warned of the possible danger to large industrial centers if such a shortage continued to exist.

A joint meeting with the New York Electrical Society on January 21st fea-

A portion of the capacity crowd which attended the Sacramento dinner-meeting at the Officers' Club, McClellan AFB, on January 27th and later toured the communications center at the base.

tured Charles F. Horne, Civil Aeronautics Administrator, as guest speaker. Donald McClure, new president of the New York Chapter, conducted the meeting, with R. Karl Honaman of the New York Electrical Society acting as co-chairman.

Mr. Horne gave a most interesting talk on the progress made in wire and radio communications for civil aviation. He reviewed the primitive systems in use in the early 1930's as compared to today's modern integrated system of communications and air navigation aids. He indicated that the present "common" system is approaching the end of a transition period when most of the airplanes in this country will be using the new VHF aids to air navigation and air communications which have proved to be much superior to the old low frequency radio aids which were initially established in the late 1930's.

The meeting was held at Schwartz's Restaurant in downtown New York, with cocktails and dinner preceding.

Philadelphia

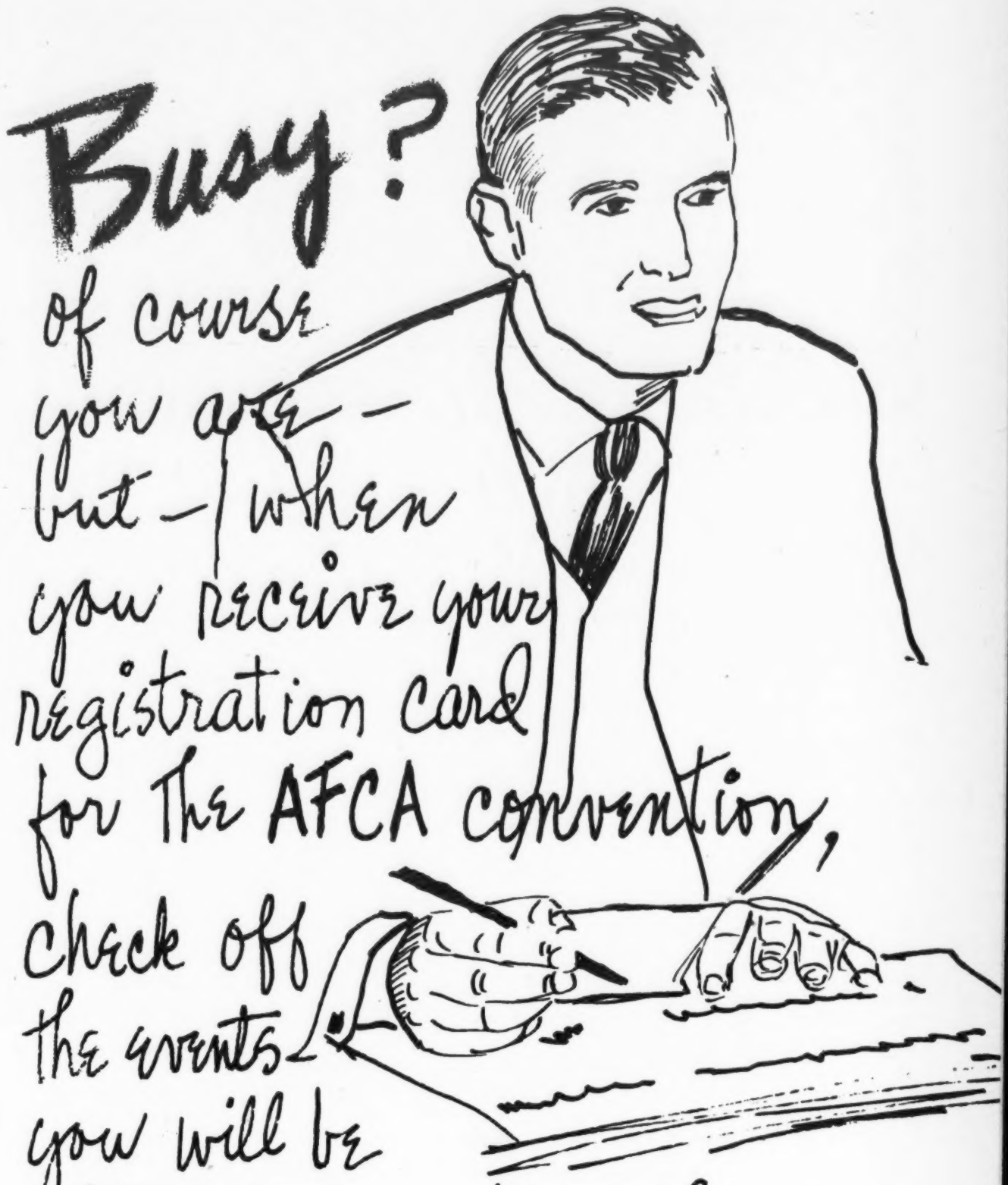
Over one hundred members, representing industry and all branches of the Armed Forces, heard Capt. Frederick R. Furth, USN, Assistant Chief of the Bureau of Ships for Electronics, discuss "Some Aspects of the Reliability of Electronic Equipment" at a luncheon-meeting on February 10th at the Engineers' Club.

Capt. Furth stressed that, instead of making and designing new and modern equipment, serious consideration should be given to "reliablizing" of current equipment. He said that a program in this direction had already been established and is in operation by the Bureau of Ships for Electronics which includes the engineer evaluation and surveillance of all electronic equipment. To illustrate a phase of this program, Capt. Furth used electron tubes, which are known to be the greatest single source of trouble, as a principal subject. In such cases, all tube failures are collected along with information on the instance and cause of the failure. A complete analysis and detailed reports precede thorough tests to determine the failure, life operating capabilities, and limitations of the tubes. The final report results in refined production techniques to eliminate such failures. This same type program is followed through on all electronic parts.

In an effort to combat the problem of extensive failures, Capt. Furth emphasized the need for more simplified designs. Less complex equipment, he stated, is easier to use and maintain because it is more readily accessible and serviceable.

Chapter President Robert G. Swift introduced as honored guest of the chapter Rear Admiral John H. Brown, Jr., Commandant, Fourth Naval District, who also addressed the group.

The new banner of the Philadelphia Chapter was displayed at the luncheon for the first time. Made to order for the chapter, it consists of orange letters on a blue background, with the association insignia in the center.


Busy?
of course you are —
but — when you receive your registration card for the AFCA convention, check off the events you will be attending, return the card by mail, at once and consider the time well spent —
then — grab your hat around May 14th and head for Dayton —

Shown at Sacramento's December meeting at Sacramento Signal Depot, l to r: Paul Carrington, past pres.; Brig. Gen. Clarence P. Talbot, new pres.; and Col. Sidney N. Storbraaten, CO of the depot.

Pittsburgh

An up-to-date report on the association and a chronological story of its origin and development was presented at the January 13th dinner-meeting by AFCA Executive Secretary George Dixon as the main speaker of the evening.

The program also included an interesting and educational film, "Communications in Civil Defense," furnished by the American Telephone and Telegraph Company.

Held at the William Penn Hotel, the meeting was preceded by a very pleasant cocktail hour and dinner. Chapter Vice President S. E. Phillips of Bell Telephone Co. officiated as master of ceremonies in the absence of President Ralph Will. He introduced to the members Mr. H. T. Inman, new Vice President and General Manager of Bell Telephone Co. in the Pittsburgh area, who recently replaced Mr. J. E. Longstreth, now Operating Vice President of Bell Telephone in Philadelphia.

Sacramento

Meeting at McClellan Air Force Base on January 27th, the chapter heard an authoritative talk on "Air Force Communications" by Lt. Col. Richard Amann, Commanding Officer of the 2049th AACS Squadron, and then toured the new communications center and the new communications maintenance building at the base. A social hour and dinner at the Officers' Club preceded the program and was attended by 300 members and guests.

Brig. Gen. Clarence P. Talbot, Deputy Commanding General of McClellan Air Force Base and the new President of the Sacramento Chapter, presided. Other chapter officers for 1953 are: vice-presidents—Joseph J. Healy, Robert McCurry and Loren Woolf; secretary-treasurer—C. A. House, who is serving his fourth term in this position; directors—Paul Carrington, A. A. Cordill, Waldemar E. Doyal, Robert D. Livingston, A. R. Tanner and Henry M. Skidmore; counsels—Army—Col. Sidney N. Storbraaten; Navy—Cdr. Jacques Chevalier; Air Force—Col. Robert C. Paul.

The enthusiasm and interest displayed by the audience during the entire program pronounced the meeting as one of the most successful events in the chapter's history. Arrangements for the meeting were made by Lt. Col. Amann.

San Francisco

The annual election of officers, and a motion picture film on the function of the telephone system as a civil defense facility in time of air attack, constituted the program of the January 22nd dinner-meeting at the New Tivoli Restaurant.

Col. Lloyd Parsons, chapter president, reviewed the activities of the chapter during the past year and discussed plans for the future. The report of the nominating committee was presented by its chairman, Col. H. L. Schnoor of the Pacific Tel. & Tel. Co., and the following slate was unanimously elected: president—Col. Lloyd C. Parsons, reelected for a second term; 1st vice-president—C. L. Wickstrom, Pacific Tel. & Tel., re-elected for a second term; 2nd vice-president—W. G. Damerow, Pacific Gas & Electric; secretary—William R. Patton, Lenkurt Electric Co.; treasurer—Russell H. Cobb, Western Union, also re-elected. Vacancies were filled on the board of directors which now consists of: Harry E. Austin, RCAC; Sydney N. Barton, Mackay Radio; R. J. Loveland, California Water & Telephone; Capt. W. B. Bailey, USN; Capt. D. E. McKay, USCG; Col. A. B. Cooper, USA; W. H. Phillips, Globe Wireless; Gordon A. Stevens, Eastman Kodak; T. H. Dooling, Exide Battery; E. G. Underwood, Station WFRC; H. L. Schnoor.

The film on civil defense was presented by the courtesy of the Pacific Telephone Co. through arrangement by C. L. Wickstrom, Defense Activity Engineer, and chapter vice-president. The film described telephone facilities as the backbone of communication during periods of emergency, and explained the use of duplicate installations and alternate routes to reduce the vulnerability of the telephone system to disabling by bomb attack. Col. Hobart R. Yeager, Western Air Defense Force, who was host to the chapter in September at Hamilton Air Force Base, portrayed a part in the film story, which added interest for the chapter members.

New officers of San Francisco Chapter: seated, l to r: R. H. Cobb, treas.; Col. L. C. Parsons, pres.; W. G. Damerow, vice-pres.; W. R. Patton, secy.; standing, l to r: Capt. W. B. Bailey, Col. A. B. Cooper, Capt. D. E. McKay, H. L. Schnoor and E. G. Underwood, directors.

San Luis Obispo

Col. Reginald P. Lyman, new commanding officer of Camp San Luis Obispo, was guest of honor at the chapter's January 26th meeting which staged a demonstration of the camp's television circuit. Col. Lyman gave a short talk on the purposes and objectives of the association and pledged his wholehearted cooperation and support in building up the San Luis Obispo Chapter.

Capt. Wallace I. Harper pointed out the different types of signal equipment currently being used to instruct students in the Southwestern Signal School. A very enjoyable demonstration was then presented of the television system in use at the school by Major Arthur R. Blethen and his crew from the radio division of the school. Following the demonstration, the members and guests were invited to watch the equipment in operation in the television studio.

During a short business meeting the present temporary officers were voted to remain in office until August at which time a general election meeting will be held. Committee chairmen were ap-

pointed as follows: publicity—Col. Mansell A. Walker; membership—Maj. John A. Norman; program—Capt. Wallace I. Harper; constitution and by-laws—Lt. Col. James A. McClung.

Among the guests present at the meeting were representatives of California Polytechnic Institute, Radio Station KATY, Pacific Telephone and Telegraph Co., and various local radio, television and photographic businesses.

Scott-St. Louis

An illustrated talk on "CONELRAD" by Ernest C. Thelemann, Central Air Defense Force, and the chapter's second annual election of officers featured the January 9th meeting at the Elks Club in Belleville.

The term, "CONELRAD," has been coined from the "Plan for the Control of Electromagnetic Radiations" and is concerned with a system for controlling the operation of standard broadcast stations in the event of air attack. The system, explained Mr. Thelemann, eliminates the need for broadcast station "blackout" during an air attack. Stations can continue operation, thereby providing essential communications for civil defense agencies. At the same time, the stations' signals cannot be used for homing or navigational purposes by attacking aircraft.

Mr. Thelemann discussed the various technical, economic, and administrative aspects of the system and paralleled his talk with slides illustrating methods and facilities of the plan.

The election results were as follows: president—Allan L. Eisenmayer; 1st vice-president—Capt. Maurice A. Rundquist; 2nd vice-president—Lt. Col. Horace T. Peck; secretary—Howard D. Yund; treasurer—Lester L. Bennett; directors—George M. Depew, Lt. Col. Richard D. Conrad, Clifford G. Wassall, J. Douglas Wagner and Michael Ebinger. Other members of the board of directors still serving are: Jack Barnes, Louis Dechant, Capt. Robert Oase, M/Sgt. John L. Porter and Richard Stewart.

Among the 120 members and guests present were representatives from Southwestern Bell, American Telephone and Telegraph, Western Electric, and various radio stations and civil defense agencies in the St. Louis area.

Seattle

Capt. Dick Quantz of the Washington State Patrol described the communications network of the Patrol, with special reference to the UHF system currently being installed to relieve the load on the existing VHF network, at the chapter's December 10th meeting. He explained their communications requirements and facilities, interconnection with other communications available in the State, and the utilization of these facilities in the Patrol work. His talk was of such interest to the audience that he was invited to appear at another meeting for further discussion of the subject.

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San Luis Obispo Chapter meeting on January 26th at the Southwestern Signal School featured a demonstration of the camp's television circuit.

During the demonstration portion of the program, Maurice Kerr of Pan American Radio Co. described two portable instruments developed by his company for field use. The first was for measurement of antenna constants to allow proper matching, and the second was a dummy antenna calibrated in effective resistance, capacitance and watts transmitter output.

Clarence Bodine, chairman of the nominating committee, presented the report of the committee, and arrangements were made to mail ballots to all members promptly so that the installation of officers could be held at the next meeting.

Mr. M. O. Anderberg, chief of the communications section, Seattle Civil Defense organization, was guest speaker at the January 14th meeting. After reviewing the history and organization of Civil Defense, he described the communications requirements in the Seattle area and detailed plans for the maintenance of an effective communication system during an emergency. A general discussion of the subject followed Mr. Anderberg's talk.

As a result of the annual election, Alfonzo A. Baird, superintendent of Western Union, was chosen as the new president. Vice-presidents Warren J. Taylor and Capt. Frank K. Johnson, USCG, and Secretary Merrill R. Stiles were re-elected for another year. Lee P. Church was elected treasurer and Cdr. Lester M. Hill was added to the board of trustees. Other trustees are: Lt. Col. Clarence D. Lawrence, Phil Duryee, James M. Campbell, and Frank D. Keyser, retiring president.

President Keyser reviewed the activities of the chapter during the past year and expressed his appreciation for the support received from the membership during his term of office. He suggested specific problems for consideration by the incoming officers, such as the revision of the chapter constitution and by-laws and the building up of the membership.

The meeting was held in the Chamber of Commerce building and was preceded by a social hour and dinner.

Washington

The chapter's February 4th luncheon-meeting was Air Force sponsored, with Col. John Bestic, Communications Director of the Strategic Air Command, delivering an illustrated lecture on "Communications-Electronics and Electronic Countermeasures in Strategic Air Operations." The ballroom of the National Press Club was filled to capacity, with many last-minute requests for reservations turned away.

TELECOMMUNICATIONS REPORTS carried the following report on the meeting:

"Swift communications is the cornerstone of the Strategic Air Command in carrying out its mission as the 'front line' of defense of the United States against enemy attack, Col. John Bestic, SAC communications-director, told members of the Washington Chapter of AFCA. In addition to military networks, the SAC relies upon commercial companies—particularly the Bell System for telephones circuits and teletypewriter exchange service—for communications facilities that must be available for operation 24 hours a day to fulfill the SAC philosophy of 'learn what has happened as soon as you possibly can' to be prepared for any eventuality in guarding the nation.

"Colonel Bestic, who lauded the commercial companies for their assistance in the development and improvement of the military systems, pointed out that in addition to voice communications and TWX service, SAC is placing increasing dependence upon telephoto for transmission of detailed information and is pointing toward greater use of voice communications in air-ground communications.

"By the use of telephoto, he stated, the Air Force has eliminated the 5% error experienced by using radio circuits in the transmitting of such detailed copy as requisition forms. He pointed out that with telephoto, requisition information for an entire day from an entire theater can be included in one photograph.

"The emphasis placed upon communications, electronics and electronic counter-measures by the SAC is demonstrated by the fact that about 6% of its personnel are in the C-E field, Colonel Bestic told the AFCA group, and through reliance upon communications and electronics the SAC is 'able to maintain a state of readiness on the front line of defense.' This is a larger ratio of C-E personnel than exists in other branches of the armed services.

"Colonel Bestic, in citing the cooperation with commercial communications companies, related how in order to speed up communications between the United Kingdom and the SAC headquarters at Offutt Air Force Base at Omaha, SAC leased transatlantic cable faciliites from the American Cable & Radio Corp."

Maj. Gen. Raymond C. Maude, Director of Air Force Communications, was presented to the gathering by Chapter President Joseph Redman, as were the following other Air Force representatives at the head table: Brig. Gen. Gordon A. Blake, Mr. Dave Trafton, Col. Charles Bagstad, Col. Don Graul, Col. Sterling Briggs, Col. Arthur Stanat, Col. Phillip Gugliotta, Lt. Col. Howard S. Gee and Mr. R. O. Smith.

New officers of Scott-St. Louis Chapter: standing, l to r: Allan L. Eisenmayer, president; Howard D. Yund, secretary; J. Douglass Wagner, director; Maurice A. Rundquist, vice-president; Lester L. Bennett, treasurer; seated, l to r: Directors George M. Depew, Richard M. Conrad and Clifford G. Wassall.

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made possible the whole new industry of electronics.

One man's belief—and the research that proved him right was the beginning of the Allen B. Du Mont Laboratories. In the future young men will find Du Mont the company where they may best realize their ambitions in the field of electronics. And Du Mont will continue to give America more of the wonders yet hidden in this electronic age.

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Du Mont is the world's foremost maker of scientific precision instruments utilizing the electronic cathode-ray tube.

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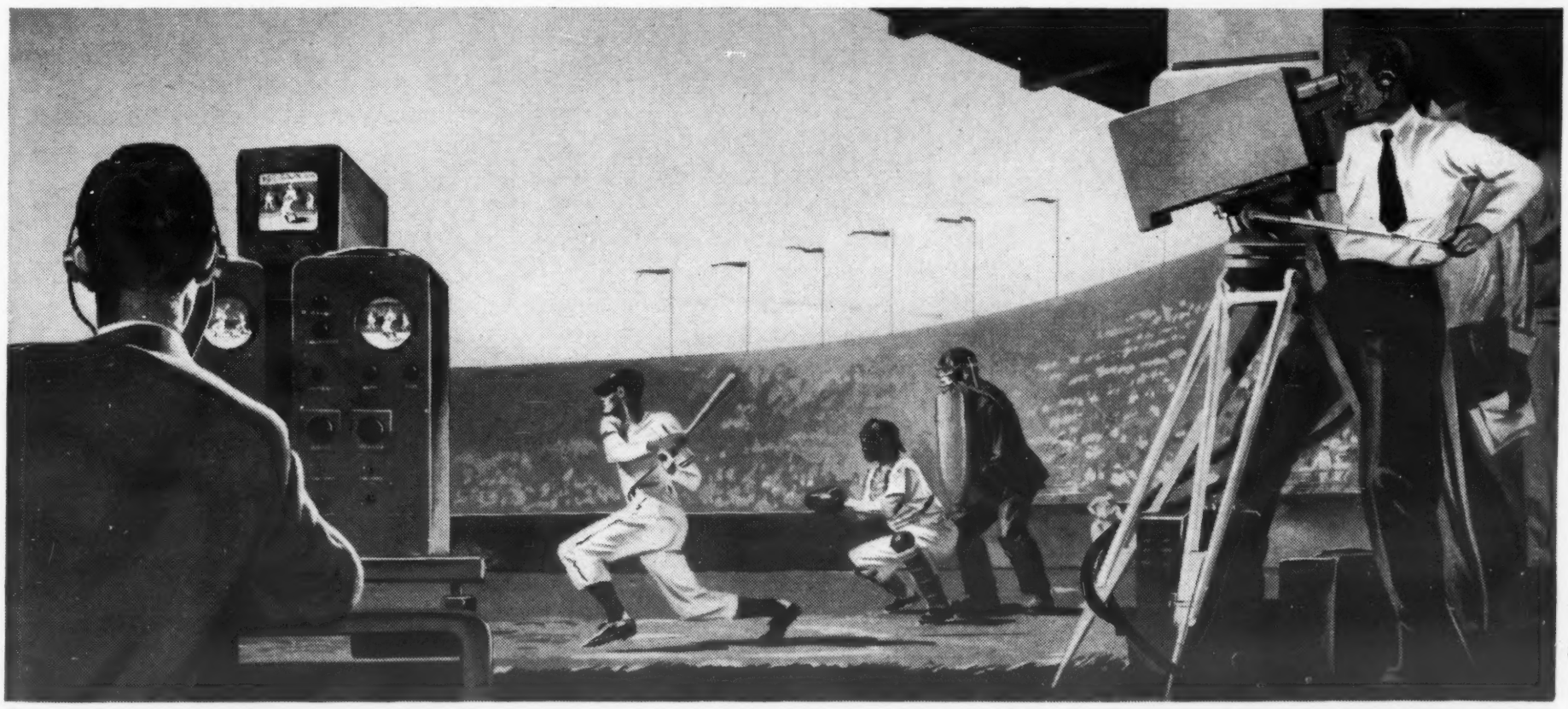
In 1933, Dr. Du Mont filed a patent application which the army asked him to withdraw for security reasons. This idea, developed in secrecy, became radar. And Du Mont is still first in high-quality radar development.

FIRST WITH HOME RECEIVERS
Dr. Du Mont built the first commercial all electronic home receivers in 1938, many of which are still giving good service.

FIRST IN DEVELOPMENT
Du Mont has developed many electronic "firsts." 1953 marks only the beginning for a company dedicated to electronic research.



FIRST IN TELECASTING—Du Mont operates the first wholly owned television network. Its key station, WABD, New York, was the first fully equipped, high-powered station on the air; was first with daytime programming.

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NEWS

Communications-Electronics-Photography

Space Messages

Western Union announced recently that high-altitude tests of its new facsimile telegraph, that flashes messages in "picture" form at the push of a button, prove that the machine works perfectly at 40,000 feet, which is about 8 miles up.

The company says it should work equally well at a 100-mile altitude where outer-space begins and air is so rarefied it's almost a complete vacuum.

The stratosphere facsimile test required no rocket flight into the wild blue yonder. What Western Union engineers did was this: they sealed a stripped-down facsimile machine inside a glass evacuation bell.

An exhaust pump in a half-hour sucked the air from inside the glass bell. Finally a special meter registered 40,000 feet, about one-half of total vacuum. Inside the glass bell the facsimile machine whirled away without interruption ready, when called upon, to flash back home the first telegram from the moon.

Basic Materials Conference

Twenty leading industrial research engineers and government scientists will comprise the advisory committee to formulate a program for the first Basic Materials Conference which will be held in June in New York concurrently with the first Exposition of Basic Materials for Industry.

The conference will be aimed at introducing the new industrial concept that a knowledge of all materials is essential before a single material can be used for a product, the committee decided after its first meeting. "It is no longer sufficient for a product engineer to be a specialist in a single material, be it metals, or plastics, or lumber, or ceramics. He must know the possiblities of each, so that he may substitute when shortages occur and so that he may design products for new uses," the committee stated.

In addition to the advisory committee for the conference, heads of 21 major companies have formed a board of sponsors for the exposition, which will be held at Grand Central Palace, N. Y., June 15-19. Don G. Mitchell, president, Sylvania Electric Products, Inc., is chairman of this board.

The conference, which will be held at the Hotel Roosevelt, New York City, June 16-18, will have as its chairman Theodore C. DuMond, editor "Materials & Methods."

One of the principal functions of the conference will be to analyze how selection of materials can be coordinated with other industrial functions, such as design, production and sales. An effort will be made not only to outline the nature of existing materials but also to study materials now being developed and those of the future.

Advance registration cards may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Surplus Sale

Two hundred and 28 surplus machine tools stored at Marietta, Ga., are being offered for sale by the Air Force. Bids will be opened at Government Aircraft Plant No. 6 at Marietta Tuesday, March 31.

The units offered for sale are the remainder of the 40,000 tools stored shortly after World War II and which were rejected through a number of screenings. They are reparable, but are not needed by any governmental agency, military or civilian.

Prior to this offer, the tools stored at both Marietta and Omaha, Neb., had been offered to different groups on a lease basis, with the Air Force retaining title. Most of the tools have been released and are in producton.

The tools first were offered to Air Force contractors, who selected those that met their needs. These were leased to them. Those remaining then were screened by agencies at Wright-Patterson AFB, such as supply, maintenance engineering and the Wright Air Development Center laboratories.

The residue were reported to the surplus materials division in Washington for screening by the Department of Defense, the National Industrial Equipment Reserve and the General Services Administration. Those remaining after all these screenings were declared surplus to the Government. A portion of them (62) were were sold last April and the 228 now being offered represent another portion to be sold at public sale to the highest bidder.

Those remaining, in some cases, have missing parts. Most of the tools are obsolete insofar as current methods of production are concerned. However, a small riveting machine may be of use to some manufacturer, whereas it is useless to Air Force contractors who now rivet or bolt large plates.

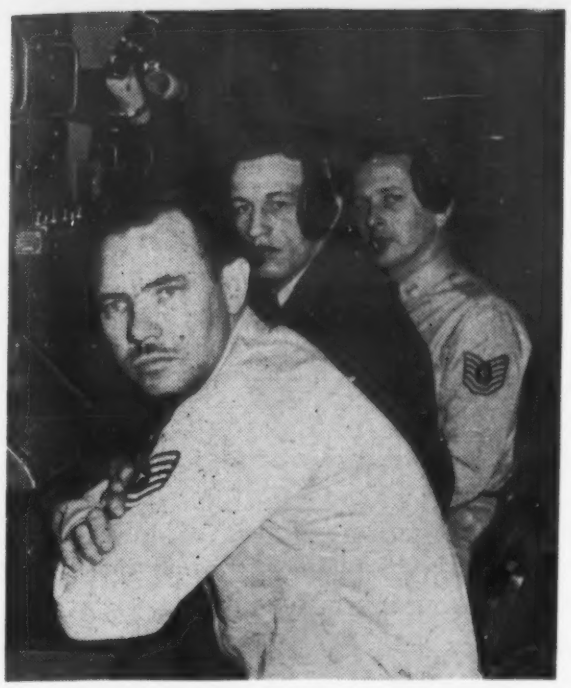
Some of the gear cutting equipment stored was of special purpose. It was of the type that produced highly finished precision gears for use in the manufacture of propellers and reciprocating engines. Since the advent of jet engines, Air Force requirements for a special purpose gear cutting equipment are approximately 25 per cent of that required during peak production of World War II. Also 95 percent of this equipment could not be converted for use in producing small gears for instruments.

Though the tools disposed of during these screenings still belong to the Air Force, the 228 offered will become the property of the purchasers, to do with as they please.

First Lt. Walter Davidson, Jr., who is conducting the sale, said each tool must be bid on separately. Bid forms and machine lists will be available at the sale site, or may be obtained by writing to "U. S. Air Force. Plant Clearance Office, c/o The Tumpane Co., Inc., Government Aircraft Plant No. 6, Marietta, Ga."

Any citizen of this country may submit a bid, Lieutenant Davidson said, and if it is high, he will receive the tool.

While bids will be opened on March 31, they must be postmarked no later than midnight, Friday, March 27. Prospective bidders may inspect the tools at the Marietta plant from March 16 to 27, from 8 a.m. to 5 p.m., Monday through Friday.



The 1936th AACS Sq., at Lajes Field, Azores, reports the reaching of the 20,000 GCA landing for the unit since its activation. A Boeing C-97 Stratofreighter bound for Frankfurt was the subject of the unit record making feat. Ground Control Approach crew "talking" the pilot to touchdown were T/Sgt. E. F. Leninger, M/St. J. L. Sullivan and T/Sgt. J. K. Titus.

ASTIA—Technical Info Clearing House

ASTIA (Armed Services Technical Information Agency) has been established to collect, index, catalog and provide storage for scientific and technical reports of the military and their contractors for the information of industry. The service of abstracting the information is a valuable contribution of ASTIA and its semi-monthly condensation, *"Technical Information Pilot,"* has been made available to qualified military contractors through the Library of Congress.

New L-3 Carrier System for New York-Philadelphia Route

The new L-3 carrier system for coaxial cables, providing three times as many telephone circuits as the system now in use, went into commercial service for the first time recently, over the New York-Philadelphia route, the American Telephone & Telegraph Co. Long Lines Department announced.

A. F. Jacobson, Long Lines Director of Operations, said an existing cable along the route has been equipped with the new system. The L-3 carrier units make it possible for one pair of coaxial tubes to carry as many as 1800 telephone conversations simultaneously, and the system also can be used to provide 600 telephone circuits and a television program in each direction over a pair of coaxial tubes.

"Initially, 260 circuits have been placed in service between Newark and Philadelphia," Mr. Jacobson said. "Additional telephone circuits will be made available during the next few months."

Mr. Jacobson pointed out that 11 new repeater stations were built midway between existing stations, so that repeaters now are located at approximately four-mile intervals along the route. New wide-band amplifiers also have been installed in the original 12 repeater stations. In testimony at the FCC's theater television hearings a few weeks ago, it was brought out that a coaxial unit equipped with L-3 carrier has a total bandwidth of 64 megacycles.

ICAF Field Course at St. Louis

Rear Admiral W. McL. Hague, USN, Commandant of the Industrial College of the Armed Forces, announced that one of the 1953 series of Field Economic Mobilization Courses will be presented in St. Louis, Missouri, May 11-12.

This presentation is being made in place of one scheduled for Duluth, Minnesota, June 1-12, which has been cancelled.

The Field Course in St. Louis will be conducted by a faculty team of the Industrial College composed of Colonel James E. Reilly, USAF, Colonels C. F. Buck, Jr., and A. R. Glafka, USA, Captain T. A. Nisewaner, and Commander J. W. Seager, USN, and Lt. Colonel M. W. Heath, USAF.

Further information as to this course may be secured from the Commandant, Industrial College of the Armed Forces, Washington, D. C.

Small Business Gets 73% of Signal Corps Contracts

Small business concerns (those with 500 or fewer employees) received 107,471 contracts, 73% of all defense contracts let by the Army Signal Corps in the period from July 1, 1950, to December 31, 1952, it was reported recently by the Office of the Chief Signal Officer. During the same period, $564,209,000 was paid to small contractors by the Signal Corps.

THIS DEPARTMENT'S PRINCIPAL SOURCE

Telecommunications Reports
Roland C. Davies, Editor
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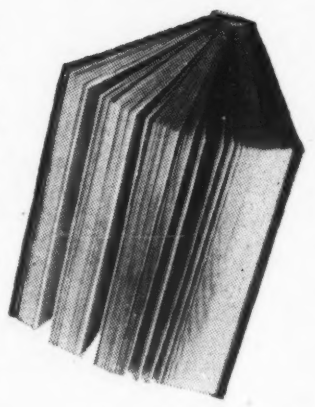

Comprehensive servicing information on all types of commercial receivers; how to repair them, how to build up a servicing business, how to do most of your testing with just 3 pieces of equipment—a vacuum-tube voltmeter, oscilloscope, and alignment generator. Clearly developed illustrations show you how and where to connect test equipment, and the correct oscilloscopic waveforms that should be viewed in different parts of the circuit. All the circuits discussed are taken from actual sets in use. Dozens of valuable hints and trouble-shooting charts save you time on the job by telling you just where to look for trouble. Thoroughgoing material on AM-FM-radio-TV-phono combinations, plus suggestions to help you set up profitable and professional enterprise. **By C. V. Rabinoff and Magdalena Wolbrecht, Dean and VicePres., American Television Laboratories of Calif., respectively. 560 pp., 375 illus., $7.50.**

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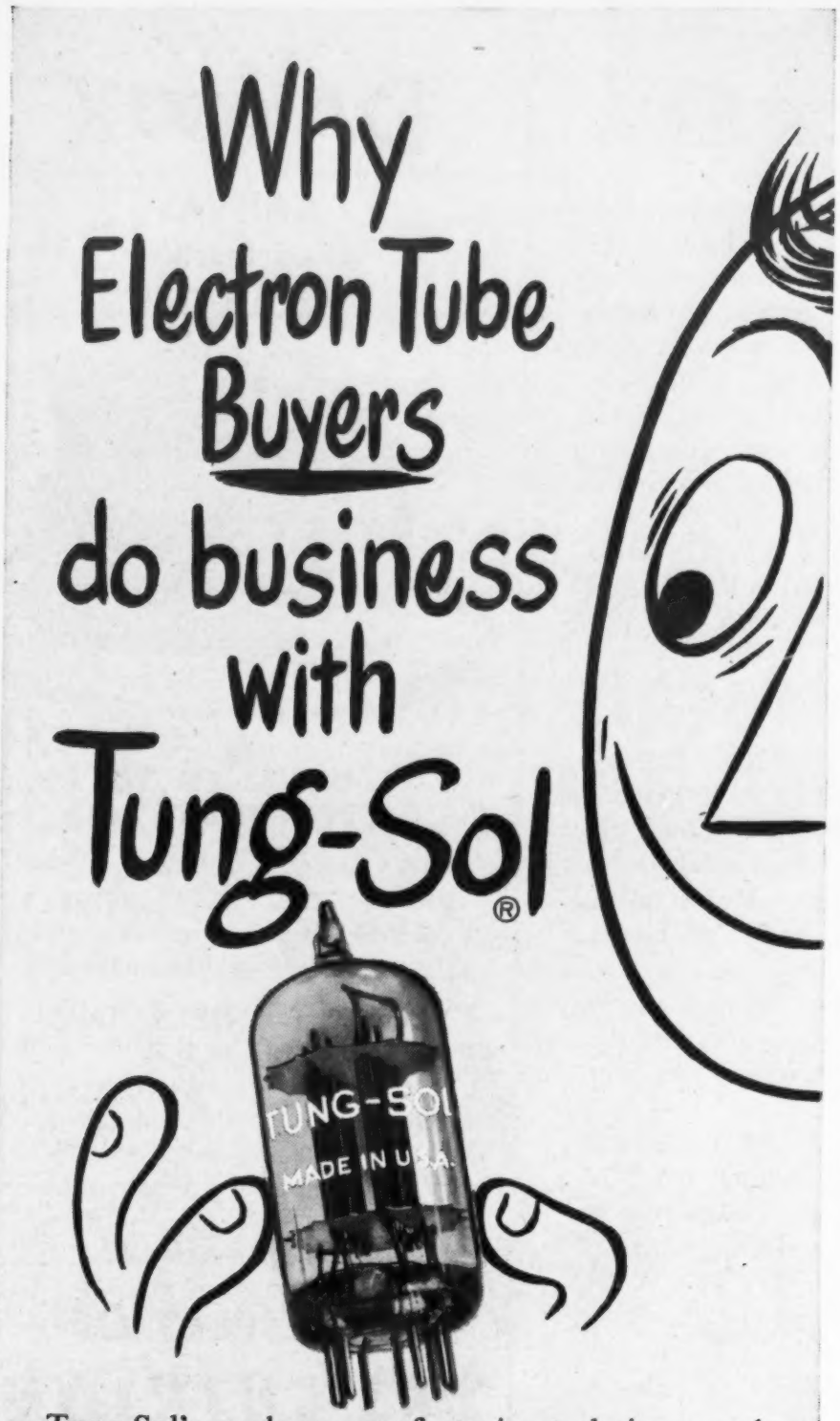

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TUNG-SOL MAKES All-Glass Sealed Beam Lamps, Miniature-Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.

Signal Corps 90th Birthday Celebration

The U. S. Army Signal Corps celebrated its 90th anniversary on Tuesday, March 3rd, with Major George I. Back, Chief Signal Officer, visiting Fort Monmouth that day to highlight the birthday in military communications prominently instrumental in the overwhelming progress of the Army's nerve center with its research and development projects.

In reviewing a year of continuing progress and achievement in many areas, the Signal Corps points with pride to the establishment of the Aviation Center at Fort Monmouth last July to apply aviation theory and procedure to the needs of military communications.

Signal Corps history was made by the opening of the first fully automatic teletypewriter switching center at Fifth Army headquarters in Chicago last December.

Another first was the Signal Corps' development of a chain radar system, making it possible to trace missiles and rockets from firing point to target. The system is now in use at the White Sands Proving Grounds in New Mexico.

In meterological research the Signal Corps announced development of new equipment to measure wind direction and speed, along with a new method of gathering temperature data high above the earth, known as the Rawin set.

Expansion of communication facilities in Alaska was another Signal Corps feature.

Last year the Signal Corps announced its first use of transistors, which in time is expected to replace most of the fragile, bulky and costly vacuum tubes in electronic equipment.

Equipping the new Presidential communications car was another Signal Corps highlight.

Many other features in research and development stress the importance of the Signal Corps—a branch of the Service always expanding and progressing since the semaphore days.

General Back's Birthday Message

The following message was sent on March 3rd by the Chief Signal Officer to Signal Corps members around the world.

"During the past 90 years—from the days of the wig-wag flag and the heliograph to the present—the Signal Corps has led the way in military communications in a manner that is unique among the armies of the world. Our progress has been marked by important work not only in communications but in such fields as photography, radar, meteorology and aviation. This traditon of scientific pioneering is one of the priceless heritages of our Corps. Paralleling this pioneering spirit has been the illustrious history of gallantry, devotion, and superb performance on the battle field. Clearly, the history of our great Corps has shown that alertness, receptivity to new ideas, resourcefulness, and a dogged determination to overcome all obstacles on or off the field of battle were by-words of our predecessors. They have set standards of accomplishments which constitute a challenge to each new generation of signalmen. I join with all members of the Corps in the pledge that this challenge will be met with courage and resolution in the future as in the past."

"MIG-Hunting" Radar

Development of the search and track radar, recently in the news for its work in detecting and shooting down a number of MIG's in Korea, stemmed from seven years of research with night-fighter radar equipment by the Westinghouse Electric Corporation.

The purpose of the equipment is to enable a night fighter plane to detect and attack enemy planes and supply fire control information by which the pilot can fire accurately without having to actually see his target.

The equipment was developed for the Navy under the supervision of engineering staff members of the Air-Arm Division, who were stationed at the time at the Company's electronics plant, Baltimore, Md., while awaiting completion of the new Air-Arm at Friendship Airport.

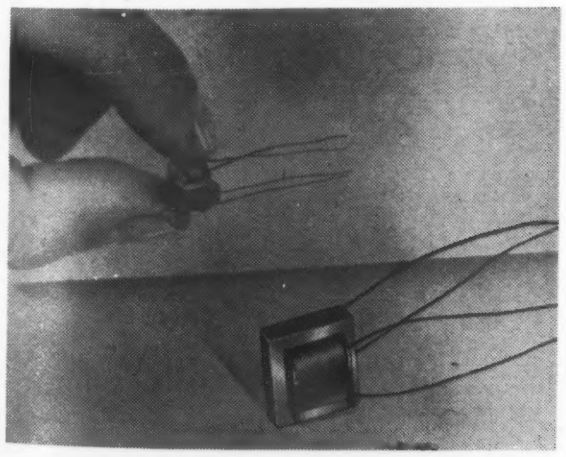
The Air-Arm division was organized in 1951 to handle development of such defense products as air-borne radar, guided missiles, and automatic pilots.

World's Smallest Transformer

Described as the world's smallest transformer, an ultra-miniature transistor transformer has been introduced by the Standard Transformer Corporation, Chicago.

Weighing less than one-tenth of an ounce, the tiny Stancor transistor transformers measure as little as one-fourth by three-eighths by three-eighths of an inch and are no larger than the transistors they are designed to power. While they are intended primarily for transistor audio applications, the ultra-miniature transformers can be used wherever low power is involved, Stancor engineers said. Useful below 1 mw level, they are constructed of extremely fine wire, wound on molded nylon bobbins, with special nickel alloy steel laminations.

New Stancor ultra-miniature transistor transformer compared with transformer previously used in transistor applications.



TV Statistics

The Chicago area now has more television sets in use than home telephones or bathtubs. W. C. Johnson, vice president-sales of Admiral Corporation disclosed the latest TV census showed 1,360,000 receivers in use in the Chicago viewing area.

There are 1,320,000 telephones in homes here, according to Illinois Bell Telephone Company. The Census Bureau lists 1,260,000 bathtubs—presumably in use—in the area.

Johnson said that in many cities which have had television for at least five years the number of sets is now greater than the total of telephones. As examples he cited Los Angeles, Philadelphia, St. Louis, Cleveland and Boston.

More than 6 million TV sets were sold last year, compared with 175,000 in 1947, the first full year of commercial telecasting, the Admiral executive pointed out. He said the first set made by his company cost 870 per cent more than a current model, using screen size for comparison.

Edison Radio Amateur Award

A 20-year-old Bible student, who served as a communications link for disaster aid in tornado-stricken Arkansas last March, received the Edison Radio Amateur Award for 1952, presented by General Electric's Tube Department in recognition of outstanding public service by a radio amateur during the past year.

The award winner is Don L. Mullican of 510 McRae Street, Searcy, Ark., who stuck to his radio amateur rig almost without relief for more than five days to bring emergency relief to Searcy and the nearby towns of Judsonia and Bald Knob.

He received a trophy emblematic of his efforts at ceremonies conducted by G.E. at Washington's Mayflower Hotel. Don took time off from his studies at Harding College in Searcy to make his first plane flight to receive the award.

CAA Sees Increased Aviation Safety

The Civil Aeronautics Administration foresees increased safety through greatly-improved air-ground communications, as a result of the beginning of a listening watch by all CAA control towers and communications stations on 3023.5 kilocycles, which will ultimately replace 3105 kc. The changes are in line with implementation of the Geneva radio conference agreement.

I introduce your wife to AFCA at the 7th Annual Convention
May 14-15-16 in Dayton
Mrs. Jesse J Walden, Jr. is planning a special program for the ladies.

PHOTOGRAPHY

APRIL 30 CLOSING DATE FOR SYLVANIA "FOLKS ARE FUN" CONTEST

"Folks Are Fun," Sylvania Electric's third annual flash photography contest, open to amateurs of all ages, opened at the National Photographic Show at Grand Central Palace on February 12, 1953.

A custom-built 1953 Nash Rambler convertible, plus one hundred other prizes, including a 21" Sylvania television console, a Bell and Howell 8mm movie camera and projector, electrical and photographic supplies highlight this year's competition. In addition, the lucky photolamp dealer who sells the winning entrant his flashbulbs will receive a $100 cash award from Sylvania.

The theme of the 1953 contest, "Folks Are Fun," according to George C. Connor, General Sales Manager of Sylvania's Photolamp Division, will give amateur photographers a wide choice of shots. Pictures of people being funny, enjoying games, parties, hobbies, children playing—any photo of people having fun can win.

This year's competition will be open to adults for the first time. Previous contests held in '51 and '52 limited entries to youngsters below the age of nineteen. 1953's "Folks Are Fun" will be opened to adults and young folks alike and will award fifty prizes in both the Junior and Senior divisions, plus an overall grand prize.

"Folks Are Fun" contest is open to anyone living in the United States or its possessions except employees of Sylvania, its advertising agencies or photolamp dealers and their families or professional photographers.

The Junior Contest division is open to boys and girls under eighteen years of age and the Senior division is open to amateur photographers eighteen years and over.

Pictures should illustrate the theme "Folks Are Fun" and all prints must be in black and white, no smaller than 2¼ x 2¼ and not previously published commercially. All pictures must be accompanied by the printed bulb identification from the outer wrapper or sleeve of any Sylvania flashbulb.

All entries must be postmarked by April 30, 1953.

A Signal Corps combat photographer caught M/Sgt. Francis Connors, Bayonne, N. J., crawling down snow-covered "Sandbag Castle" after placing the U. S. colors atop the icy slope. Red snipers, just 15 yards away, were unable to capture or destroy the flag. The Signal Corps photographers stay right at the front to get photos like this.

CLOSE SUPPORT AERIAL PHOTOGRAPHY

Constantly increasing emphasis on Signal Corps tactical photography and emphasis on extending the applications of Army aerial and ground photography to tactical combat support is strengthening the importance of the camera as a weapon.

Combat-tested procedures, adoption of field expedients and general progress in the field of Signal Corps aerial photography are now providing basis for development of up to date doctrine in this technical task which is being accomplished by the photographic sections of the Divisions and Corps in combat and training. Detailed information on this subject will be included in the next publication of FM 11-40, "Signal Photography," which is now in final stages of writing.

A condensed version of facts and recommended procedures from which latest doctrine is being drawn is set forth in this article. These procedures and methods have been successfully followed by various units in combat in Korea and training.

To perform the close support tactical photo mission, which is a supplement to Air Force high altitude aerial photo coverage, Signal Corps photographers of Division and Corps photo sections are airborne by Army aircraft. The film is exposed in aerial cameras including the K-20 which is manually operated and the K-24 and K-25 which are electrically operated. Both the K-20 and the K-25 are equipped with lenses of 6-3/8 inch focal length and the K-24 is built to utilize, among others, a 12 inch and 20 inch focal length lens. The use of the longer lenses, in addition to being generally desirable, was necessitated to permit the additional safety of higher photo flight after enemy small arms fire became increasingly intense in some areas, and some anti-aircraft action against light planes was encountered. Additional aerial camera equipment of more advanced technical features is now in testing stages in the Z I.

Oblique and vertical pictures are made by Signal Corps photographers to meet the needs of combat commanders for low-level, (under 8000 feet), quickly available aerial views of specified areas or objects, and are applied primarily to give direct support to tactical military operations. Corps and Division G-2 (Air) representatives and Artillery S-2 personnel are the most active in requesting aerial photo missions and in supervising utilization of resultant photographs. Other units also request aerial photos of specific areas or objects. Normally their requests are routed through appropriate G-2 or S-2. In general the overall requirements amount to all the low-level aerial intelligence that lends itself to recording on film. To be of greatest benefit, the pictures must be of excellent quality and must be available within minutes or a very few hours after the request is made.

FOURTH INTERSERVICE PHOTOGRAPHY CONTEST

The Fourth Interservice Photography Contest conducted jointly by the Army, Air Force, and Navy (including the Marine Corps and Coast Guard) will be held at the Pentagon in Washington, D. C., on or about May 15, 1953.

The following general rules will govern the contest:

a. Entries will be photographs which have been taken by individual

contestants. Developing, printing, and enlarging of black-and-white photographs is encouraged.

b. Only black-and-white photographs and color transparencies taken after January 1, 1951 will be eligible for competition.

c. The individual or individuals who are subjects of portraits photographs must authorize in writing on the entry form the submission of the entry in the contest and its use in contest publicity.

d. No official military photographs will be submitted as entries.

e. Entries deemed unworthy of consideration or unsuitable for exhibition will be withdrawn from the competition.

f. All Army, Navy, Marine Corps, Coast Guard, and Air Force personnel on active duty for more than 90 days are eligible to participate.

g. No contestant may withdraw an entry during the contest.

h. Seven places in black-and-white photographs and three places in color transparencies will be awarded in the final contest.

Entries will be submitted in two classes (black and white, and color transparencies) and there will be no separate categories within the two classifications.

a. Class I: Black-and-white enlargements will be 5 x 7 inches minimum and 16 x 20 inches maximum in size. Black-and-white photographs will be unmatted and unmounted. No tinted or color-toned photographs will be eligible for competition. Negatives will not be required.

b. Class II: Color transparencies will be 35 mm. minimum to 4 x 5 inches maximum in size. Transparencies will be submitted in cardboard mounts.

To facilitate cataloging and handling, entries will be identified as follows:

a. Black-and-White Enlargements: Name, rank or rate, service number, duty station, and title of entry will be printed on a 3 x 5 inch card affixed to the back of the photograph.

b. Color Transparencies: Name, rank or rate, service number, duty station, and title of entry printed on mount.

A group of professionally recognized photographers will be invited by the joint sponsors of the Fourth Interservice Photography Contest to select the grand final contest winners. Entries will be judged primarily upon originality, interest, and appeal. While good craftsmanship is important and desirable, photographic technique will be a secondary factor in determining winners. Color transparencies will be considered separate-

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: *GRANODIZING** FOR LONG PAINT LIFE ON STEEL

"GRANODINE" FORMS A DURABLE PAINT BOND

Granodizing forms a crystalline, zinc phosphate coating on steel. This ACP paint-bonding process chemically changes the surface of steel into an inert non-metallic coating made up of thousands of microscopic zinc phosphate crystals.

Granodized steel thus presents a surface much more receptive to paint than untreated steel. Its crystalline structure permits a firm and durable "keying" or bonding of the paint finish. And the "Granodine" zinc phosphate coating itself is actually integral with the metal from which it is formed.

"GRANODINE" CAN BE APPLIED BY DIPPING, SPRAYING OR BRUSHING

Granodizing can be accomplished by:

1 Dipping the work in tanks;

2 Spraying the parts in a power washer; or

3 Brushing, spraying, or flow-coating the work with portable hand equipment.

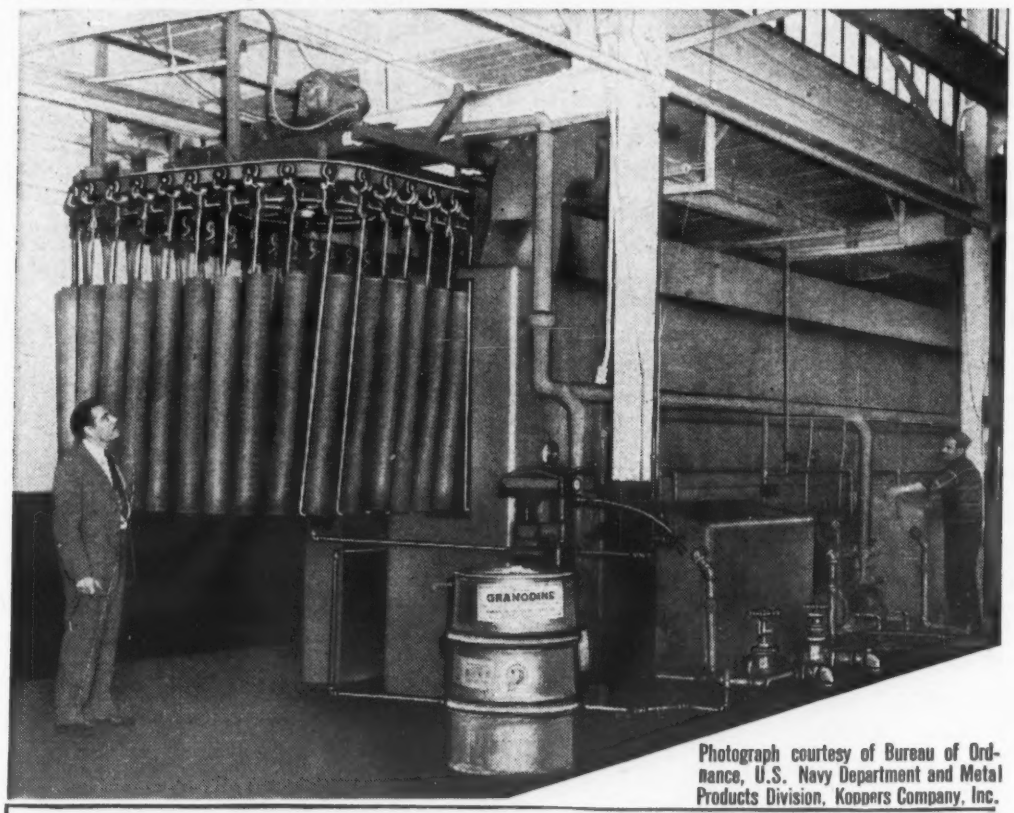
Choice of process is usually decided by such factors as the size, nature, and volume of production.

"GRANODINE" STANDARD PRACTICE ON BOTH CIVILIAN AND MILITARY PRODUCTS

Automobile bodies and sheet metal parts, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, tanks, trucks, jeeps, containers for small arms, cartridge tanks, 5-gallon gasoline containers, vehicular sheet metal, steel drums and, in general, products constructed of cold-rolled steel in large and continuous production are typical of the many products whose paint finish is protected by "Granodine".

In military production, "Granodine" is used to obtain a zinc phosphate finish meeting Grade I of JAN-C-490 and equivalent requirements of other specifications.

*"GRANODINE" Trade Mark Reg. U.S. Pat. Off.



Photograph courtesy of Bureau of Ordnance, U.S. Navy Department and Metal Products Division, Koppers Company, Inc.

Typical power spray washing machine for the automatic application of a protective phosphate coating to metal parts in preparation for painting. These 5" rocket motor tubes, as well as products made of cold rolled sheet steel, are effectively phosphate coated in such equipment.

CHEMICALS ACP PROCESSES

ly from black-and-white enlargements.

The Perpetual Interservice Photography Trophy will be awarded the service with the greatest number of prize-winning entries, and in addition, a trophy for the most popular entry as determined by public ballot will be awarded at the conclusion of the first week of the exhibition in the Pentagon.

Further information regarding the Interservice Photography Contest may be obtained at the various Service Headquarters.

DOUBLE CHECK

When using any frame-type finder such as is found on a Speed Graphic or the type found on better twin-lens reflexes, it is important to center your eye accurately behind the rear sight in order to obtain a true framing of the scene covered by the camera lens. As a double-check, it is always safest to allow just a bit more margin on all sides of your subject than is actually desired in the finished picture. You can always crop, but you can't add what isn't on the negative.

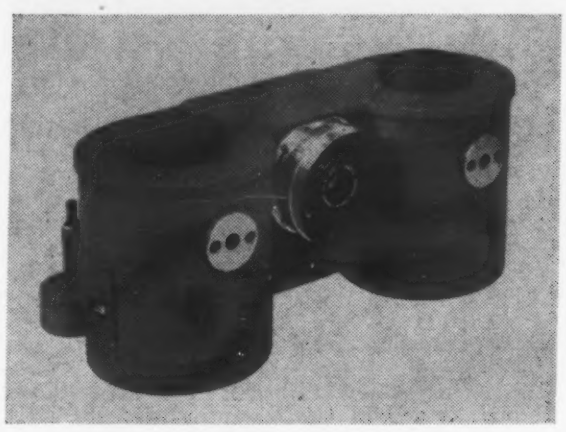
PHOTOGRAPHIC ENGINEERS CONFERENCE ANNOUNCED

The Society of Photographic Engineers has announced plans for their 3rd Annual Conference to be held May 21, 22 and 23, 1953 at the Thayer Hotel, West Point, New York. Some thirty-five papers covering new developments in photographic engineering and an exhibit of the latest equipment, instruments and devices in the field will be presented during the three day meeting.

A more definite program will be announced by the Conference Committee at a later date, and anyone desiring full information should contact the Conference Chairman, Mr. Kenneth Shaftan, J. A. Maurer, Inc., 37-01 31st Street, Long Island City, N. Y. Information concerning papers to be presented should be forwarded to the respective papers chairmen: Mr. Peter Krause, Pavelle Color Labs., 533 W. 57th Street, New York City for papers on Science in Photography, and Mr. Shaftan (address above) for papers on Photographic Instrumentation.

The exhibits will include commercial, non-commercial, military, and historical photographic apparatus and displays of scientific photographic equipment.

THE AUTO CAMERA MARK 3



A new, low-cost, recording camera having a very wide range of applications, the Auto Camera Mark 3, was recently announced by J. A. Maurer, Inc. of New York. The Auto Camera, originally designed for aircraft instrument recording by D. Shackman & Sons, Ltd., London is finding its way into many scientific, engineering and industrial applications ranging from instrument recording to time-lapse photomicrography.

Its operation is fully automatic, providing for pulse operation to as fast as 4 frames per second. Film capacity in special cassettes is 21 ft. and two models of the camera are available, one providing for two hundred 1 in. by 1 in. frames, and the second, for three hundred ¾ in. by 1 in. frames. Special spring motor provides power for camera operation with the cycle initiated by electrical pulses of either 12 or 24 V DC. Five shutter speeds from 1/10 to 1/200 second are provided in addition to a "time" setting. The Auto Camera Mark 3 weighs under 6 pounds. Normally provided is a 36-mm f/3.5 lens having a total angular field of view of 30°. Many other lenses and accessories are available.

AVOID OUT-OF-FOCUS SHOTS

Because most lenses vary a few millimeters from the rated focal length, it is important to have camera focusing scales matched to the specific lens to be used on the camera. This job is best done by the camera manufacturer or a skilled technician with the proper special equipment. Photographers planning to fit a favorite lens to a new camera or to replace the lens with which the camera was equipped at the factory should obtain new matched focusing scales to avoid the disappointment of close-up work.

LOW-ANGLE SHOTS

A useful feature to look for when buying a center post tripod is reversibility of the center post to provide extremely low-angle camera support for those unusual "worm's-eye" views that can often make an outstanding picture out of an ordinary scene.

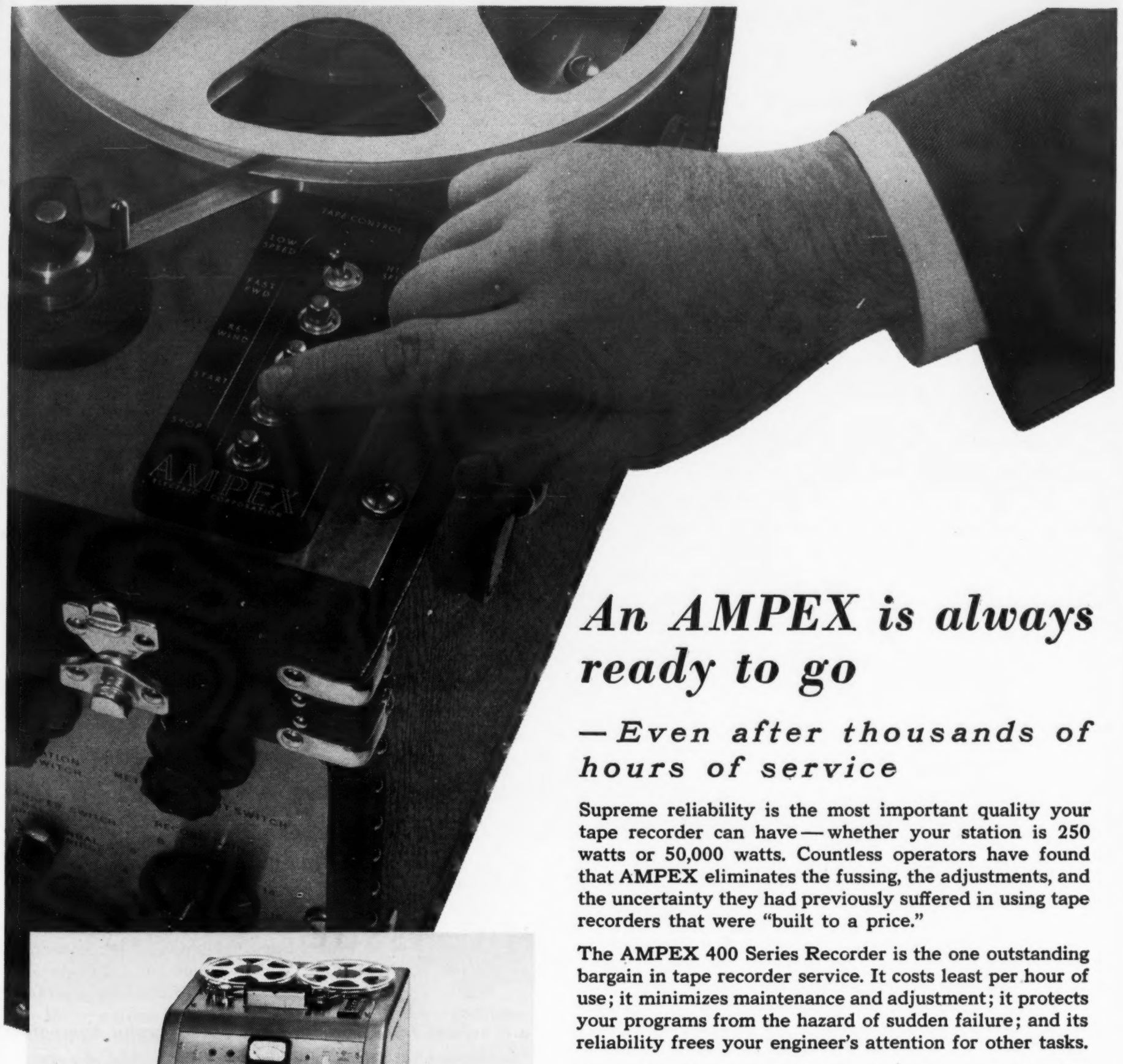
LIGHT INTENSITY FROM ARC LAMP STABILIZED BY PHOTO-CELL CONTROL

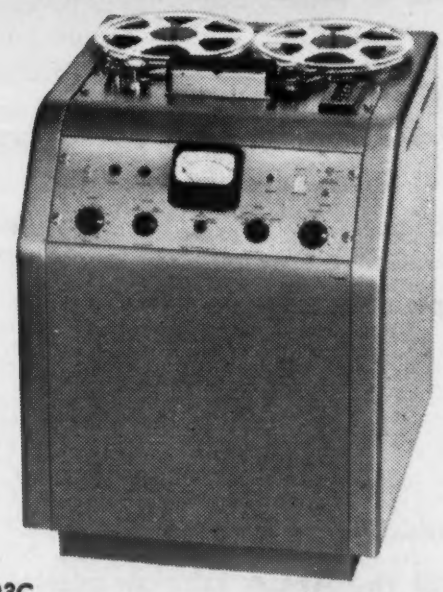
A photoelectric cell which stands watch over a source of light now makes possible, for the first time, light of unchanging intensity from a high pressure mercury arc lamp. Engineers of the Hanovia Chemical & Manufacturing Company, Newark, have recently combined a special mercury vapor arc lamp with an electrical light-monitoring system that minimizes any fluctuations in the lamp's output. This new source of highly stable light is finding important use in photochemical research and motion picture printing.

Light radiated from a high pressure arc lamp normally varies in intensity owing to factors such as changes in electrical supply voltage and in ambient temperatures, or the cooling effects of air drafts. In the new Hanovia arc lamp, a photoelectric cell in the power supply controls the arc current through an electronic circuit. Any increase in the light reaching the photocell causes a reduction in arc current, while a decrease in light results in a stronger arc current. The photocell, continuously monitoring the light output, steadily maintains any desired level of light.

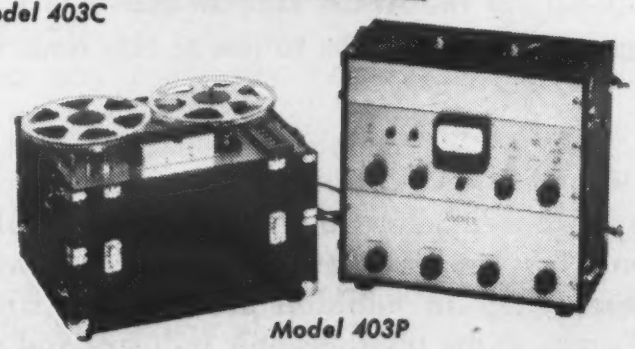
The range of light levels at which the stabilized arc can operate is from maximum current to about ten percent of maximum, for any length of time. These wide limits can be attained because the heat of the electric arc is no longer utilized to maintain the internal vapor pressure, which now depends on auxiliary heating elements. Within these limits instantaneous changes in light level can be made.

The unique freedom from fluctation characteristic of the new Hanovia lamp as a light source is enabling it to meet successfully such critical applications as the measurement of transmitted light by instruments in photochemical research and the printing of sound tracks in motion pictures.





Model 403C



Model 403P

If you plan for tomorrow, buy an AMPEX today.

An AMPEX is always ready to go

— Even after thousands of hours of service

Supreme reliability is the most important quality your tape recorder can have — whether your station is 250 watts or 50,000 watts. Countless operators have found that AMPEX eliminates the fussing, the adjustments, and the uncertainty they had previously suffered in using tape recorders that were "built to a price."

The AMPEX 400 Series Recorder is the one outstanding bargain in tape recorder service. It costs least per hour of use; it minimizes maintenance and adjustment; it protects your programs from the hazard of sudden failure; and its reliability frees your engineer's attention for other tasks.

Even after thousands of hours of service, your AMPEX Recorder will be reliable in these important ways:

- ***When you press the button, it operates***
- ***Program timing stays accurate***
- ***Starting, stopping, and rewind will operate smoothly***
- ***Fidelity will still be high***
- ***Maintenance costs will still be low***

For new broadcast application bulletin, write Dept. P-1041

AMPEX

MAGNETIC RECORDERS

AMPEX ELECTRIC CORPORATION
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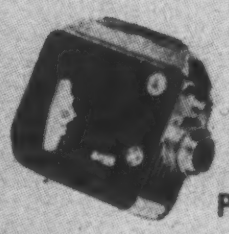
SIGNAL's FIRST PHOTOGRAPHIC ISSUE



The May-June 1953 issue of SIGNAL Magazine will be devoted to Photography and the Photographic Industry. Spotlighted in the enlarged feature section will be: Personalities in the photographic world . . . Hints for improved amateur picture taking . . . Stories of companies which have pioneered in the industry . . . Advancement of commercial photography . . . War and peace photography in the Services . . . New and interesting books.

In this all-photographic section, space will be reserved for a number of "Company Articles". These stories (on a first-come-first-served basis) will tell the history of your company and its products. Articles for our "Who's Who" will be welcomed. Your candidates for this department may include inventors, scientists, photographers, company officials or anyone distinguished in the field. News of happenings in the photographic industry—new equipment on the market—helpful suggestions for the amateur photographer—all will be used to the best advantage of our readers and you.

Above all, keep your name before the members of AFCA, and the estimated thirty thousand readers of SIGNAL including key people in Industry and the Services. Place your advertising in SIGNAL and take advantage of publicizing your products before this vital group. Rates for advertising are listed on the next page. Deadline for advertising copy for the Photographic Issue is April 15, 1953.

Get in Focus ! !

Be Represented in SIGNAL's *FIRST*

PHOTOGRAPHIC ISSUE

The above material is a reproduction of the center spread of a brochure recently sent to all photographic companies and those who would be interested in SIGNAL's first all photographic issue. Below are listed AFCA's group members in the photographic industry as they appeared on the 4th page of the brochure.

AFCA Group Members in the Photographic Industry

Argus Cameras, Inc.
DeVry Corporation
Eastman Kodak Company
Federal Mfgr. & Eng. Co.
General Aniline & Film Corp.
General Electric Company
Graflex, Inc.
Haloid Company
Hycon Manufacturing Company
Ilex Optical Company
Remington Rand, Inc.
Simmon Brothers, Inc.
Sylvania Electric Products, Inc.
Technicolor Motion Picture Corp.
Wollensak Optical Company
Photographic Society of America
Society of Motion Picture Engineers

These companies and organizations in the photographic world as members of the AFCA take an active part in carrying out the objectives of the Association. Other companies are extended a sincere invitation to join at this time. For further information, contact the Executive Secretary, George P. Dixon.

Watch for the First All-Photographic Issue of Signal

Articles in the May-June issue of SIGNAL will include stories about: The Baltimore News Post—Newspaper Photography; Alexander Simon Walcott, Pioneer in Photography; Developments in Television of the Air Force; Upper Atmosphere Photography; Picture History of the Army Pictorial Service from the Civil War to Korea; Color Commercial Photography; Photographic Instrumentation; Microfilm Processes; Tactical Photography. In addition are planned stories about companies in the photographic industry and their products, and interesting items for the amateur and professional photographers.

PHOTO

Scientific Photography in Photo Year-Book Article

From the vast reaches of the universe to the minute distances within the atom. That's the range of scientific photography today.

Glenn E. Matthews, technical editor of Kodak Research Laboratories, cites numerous photo uses in a new, illustrated article, "Photography in the Service of Mankind," appearing in "Photography Year-Book, 1953."

Commenting on photography in the study of the universe, he notes the extent to which photographic plates, with the aid of the great telescopes, have recorded valuable information. These photographs will permit measurement of much valuable data, such as brightness, composition, mass, and speed.

On use of photographs in study of the earth, Matthews writes that aerial photos were made from ballons about a hundred years ago. But only within the past thirty years has aerial photography become of great significance. Uses today include surveying, charting and map making, locating mineral and oil deposits, conducting archaeological surveys, appraisal of flood or fire damage, plotting hidden shoals, and making tax, highway, and traffic surveys.

In several pages on industrial and technical photography, Matthews reports that only a third of photo sales today are for amateur uses. About 67 per cent of the uses represent commercial, industrial, publishing, radiographic and medical, motion picture, and scientific applications.

He mentions growing use of photocopying, rapid photo printing, and microfilming.

"Microfilming of all types of records and documents has, in recent years, become recognized as one of the best methods of preserving such records against possible loss or destruction as well as conserving valuable storage space."

Matthews concludes with an account of how photography aids in the study of atomic structure. He indicates that photography in nuclear physics is helping add new knowledge that may eventually bring a clearer picture.

In addition to Matthew's article, the 1953 volume contains pictures of the year from the U. S. and various countries in Europe and Asia; illustrated articles on the photography of Cecil Beaton, Italian photography, color, photo-reporting with miniature cameras, modern American pictorialism, and the evolution of pictorialism.

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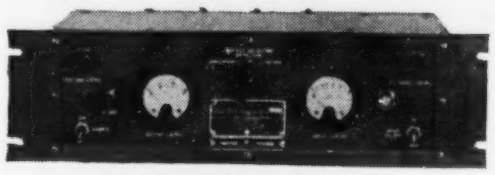
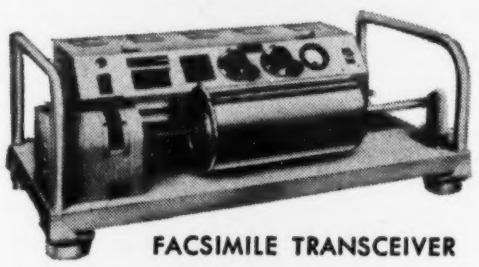
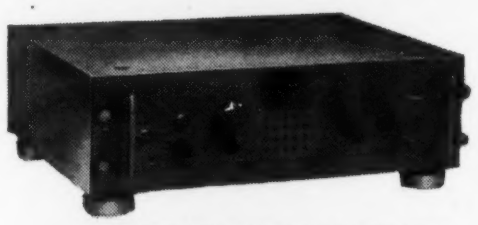
NEW CARGO PACKERS TECHNIQUES ASSURE SAFE ARRIVAL OF THE MOST SENSITIVE ASSEMBLIES



KEYER ADAPTER



FACSIMILE TRANSCEIVER



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Specifying Cargo Packers for complete packaging service means thorough, dependable protection for the most fragile equipment. You save valuable floor space, costly machines and the need for trained packaging personnel. Cargo Packers production line methods save time, detail work, costly errors and money! The new illustrated brochure explains the service in detail. Requests for copies will receive prompt attention. Ask for a copy, now!

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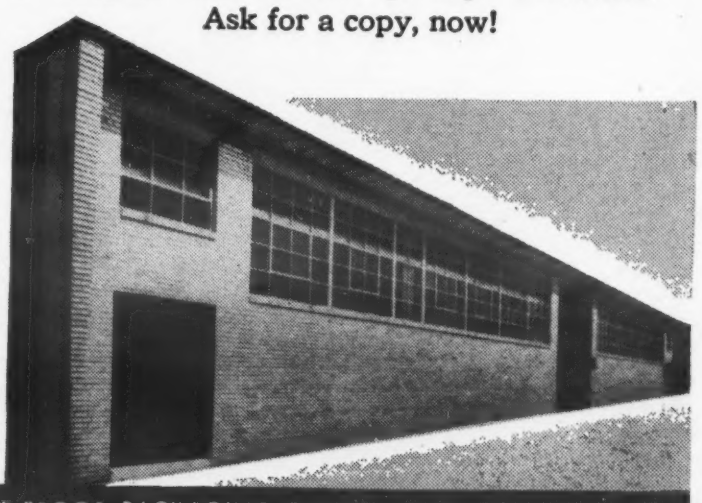

SPECIALISTS IN CLIMATE PROOF PACKAGING FOR THE ARMED FORCES AND INDUSTRIAL ORDNANCE

Radio Military Amateurs

1953 ARMED FORCES DAY WILL INCLUDE AMATEUR ACTIVITIES

The Army, Navy and Air Force will offer a joint program for radio amateurs on Armed Forces Day, May 16, 1953.

The fourth Armed Forces Day and the week preceding will be distinguished as a time for tribute to the teamwork of the Armed Forces, to the unity of the American people, and to the power and principles for which they stand in the World-wide struggle for peace.

The Military Affiliate Radio System, representing the Army and Air Force, will team up with the Navy to offer a receiving competition and a military-to-amateur radio station test similar to previous Armed Forces Day exercises. A new feature this year will be the radioteletypewriter transmission in each U. S. time zone for amateurs who possess RATT equipment.

The receiving competition will be open to any short wave listener who can copy International Morse Code at 25 words per minute. Listeners who submit a perfect copy will be awarded certificates attesting their code copying proficiency.

Amateurs submitting page copy of the radioteletypewriter transmission will receive special letters of acknowledgment.

Participation in the military-to-amateur test will be restricted to holders of valid FCC amateur radio operator licenses. Headquarters stations of the Army, Navy and Air Force (WAR, NSS and AIR) will establish radio contact with amateur stations and will acknowledge contacts with special Armed Forces Day QSL cards. Each service headquarters will QSL separately so amateurs will have an opportunity to qualify for three different QSL cards.

MARS and Naval activities licensed for amateur operation are being encouraged to feature amateur radio in their local area Armed Forces Day programs — open house, message handling, equipment demonstrations and other similar activities.

(As this is prepared for publication, transmission times and frequencies are not available. Details of activities described in this article are available on request. Write to Armed Forces Day Contest: Room BE-1000, The Pentagon, Washington 25, D. C.)

Amateur radio station K6NCB, located at the Master Control Station of the 11th Naval District Reserve Communications Network, San Diego, California, is in operation from 8 A.M. to 4:30 P.M. every Monday through Friday.

TO THE MOON AND BACK

Amateur radio operators have succeeded in bouncing a short-wave signal off the moon and making visual recordings of the returning echoes.

Two engineers in Washington, D. C., accomplished the feat in late January strictly as a project in their favorite hobby of amateur radio. They are Ross Bateman, whose amateur call sign is W4AO of Falls Church, Va., and William Smith, W3GKP, of Spencerville, Maryland.

Although a moon echo has been obtained before—in 1946 by the U.S. Signal Corps, and last year by the Collins Radio Company of Cedar Rapids, Iowa, under government contract—this is the first time anything of the sort has been accomplished with amateur power and amateur techniques. The work was accomplished from W4AO's home. Bateman and Smith used about 650 watts of power output; the military and commercial attempts employed many thousands of watts.

The two Washington area amateurs began their experimentation several years ago. On July 15, 1950, they obtained one tiny "beep" echo and caught it on a wire recorder; but they wanted something more solid than a single faint and somewhat dubious return on which to rest their case. Work continued in the intervening time, with dozens of unsuccessful attempts. Improvements were gradually made in receiver signal-to-noise ratio, antenna gain and directivity, and in other equipment aspects. A new "stacked rhombic" antenna was constructed.

A primary difficulty of such tests is waiting for the moon to get in the proper position. The antenna, immovable because of its bulk, is permanently installed in a specific direction and the amateurs simply have to mark time until that part of the 28-day moon's orbit which brings it to the optimum position. Even then it is in the ideal spot for only a few moments, during which the entire experiment must be made.

To the question "Where do we go from here?" Smith has some ready

"I Read You Five..."

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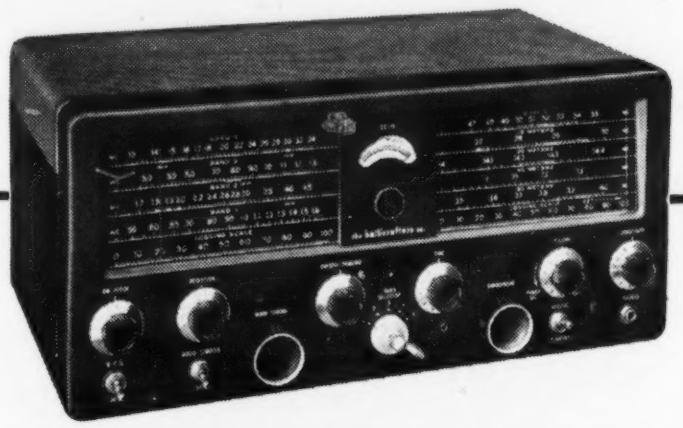
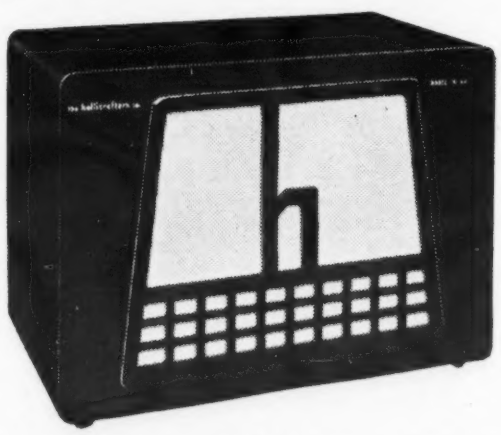
You see, these sets are designed and built specifically for the ham operator. They are planned with an amateur's problems, and pocketbook, in mind. They enjoy the best reputation in the world with this critical group of experts. You can *hear* why every night in the year on the air. Just listen!

Top Selectivity—Low Price! Model SX76. Dual Conversion Super with 50 kc amplifier for tops in selectivity. 500 kc at 6 db down—3.5 kc at 60 db down. Giant 4-in. "S" meter. 540-1580 kc, 1.72-32 Mc in 4 bands. 1 r-f, 2 conversion, 2 i-f stages. 5 pos. selectivity. Phono input jack. 3 watt output. Only **$179.50**



A Ham's Dream! Model SX71. Com. Rcvr. especially designed for top ham performance. Double conversion, built-in NBFM limiter stage. 538 kc to 35 Mc, 46-56 Mc in 5 bands. Temp. Comp., voltage reg. 1 r-f, 2 conversion, w i-f stages. Xtal. filter, w-pos. selectivity, 18½" x 8⅞" x 12" deep. Ship. wt. 51 lbs. 115 V. AC, 11 tubes reg., tect. Only **$224.50**

TVI Suppressed 100 Watter—Model HT20. The transmitter you've been waiting for! Continuous coverage from 1.7 Mc to 30 Mc. Full band switching, no plug-in coils; choice of 10 crystals. Shielded, filtered r-f compartment plus low-pass 52 ohm coaxial line output filter cuts anything over 30 Mc. Only **$449.50**



Matched Speaker—Model R46. The perfect speaker for SW. Includes transformer of 500/600-ohm input. Voice coil impedance 3.2 ohms. 10" cone. Gives excellent response for either voice or cw. Heavy construction throughout for years of service. Black finish. 15" x 10⅞" x 10⅞" deep. Only **$19.95**

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Strike back

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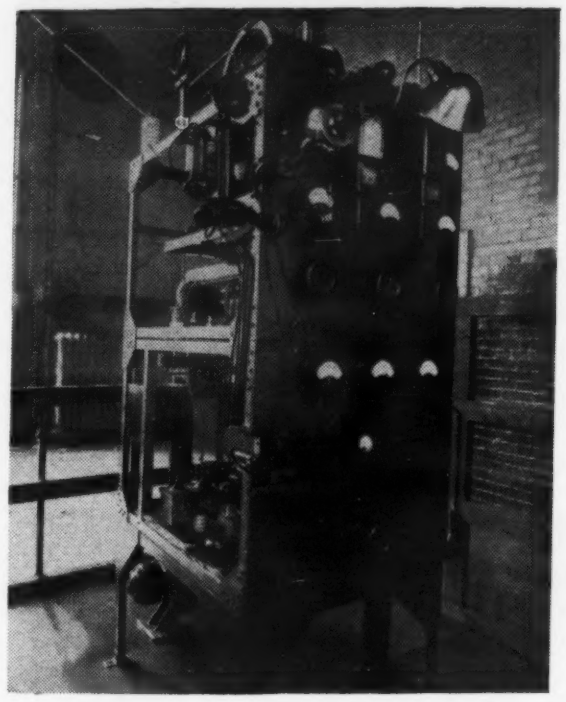
Your gifts to the American Cancer Society help guard those you love.

Your dollars support research in a hundred laboratories and universities . . . spread life-saving information . . . ease pain and suffering ...provide facilities for treatment and care of cancer patients.

It is a sobering fact that cancer may strike anyone tomorrow: strike back today with a gift to the American Cancer Society. You may mail it, simply addressed CANCER, c/o your local post office.

American Cancer Society

answers. "This is the end of Phase A—we've got an echo. Phase B will be to transmit intelligence to another station. Phase C will be to work somebody, two-way. Phase D will be to break the record (now about 1400 miles) for terrestrial communication by moon echo. Phases E, F—well, this can go on indefinitely. After three years we're just getting started."



NAA Broadcast Transmitter in December, 1925.

NAA Arlington

On February 13, 1913, the Navy's first high-power radio station, NAA, was placed in operation at Arlington, Virginia. As a result of the complete and efficient service rendered not only to the Navy but to many commercial, experimental, and amateur activities throughout the world, NAA acquired the reputation of being one of the outstanding stations of its kind.

The property on which the station was located originally consisted of 13.4 acres transferred from the War Department to the Department of the Navy by an Act of Congress, as it was formerly a part of Fort Myer, Va. In 1917, expansion required the purchase of an additional adjoining three acres.

The three main towers, one 600 feet high and two 450 feet high, were supplemented in 1922 by one 200-foot tower and one 190-foot tower to accommodate antennas for additional transmitters. There were also located on the property some 16 additional poles ranging in height from 25 to 70 feet which supported other antennas of various types. The original transmitter installation consisted of 100-kw. spark, 100-kw. arc, and 5-kw. arc sets. During 1924, these transmitters were replaced with vacuum tube transmitters.

Because of the ever-increasing demand on this station for additional facilities, and because it was becoming quite evident that this location could not satisfactorily accommodate such requirements, it was decided in 1937 to move transmitting operation to Annapolis, Md. In April 1951, this transfer was completed and the towers at Arlington were removed. Thus, Arlington lost one of its old familiar landmarks.

WASHINGTON AMATEURS ASSIST MUSCULAR DYSTROPHY TELETHON

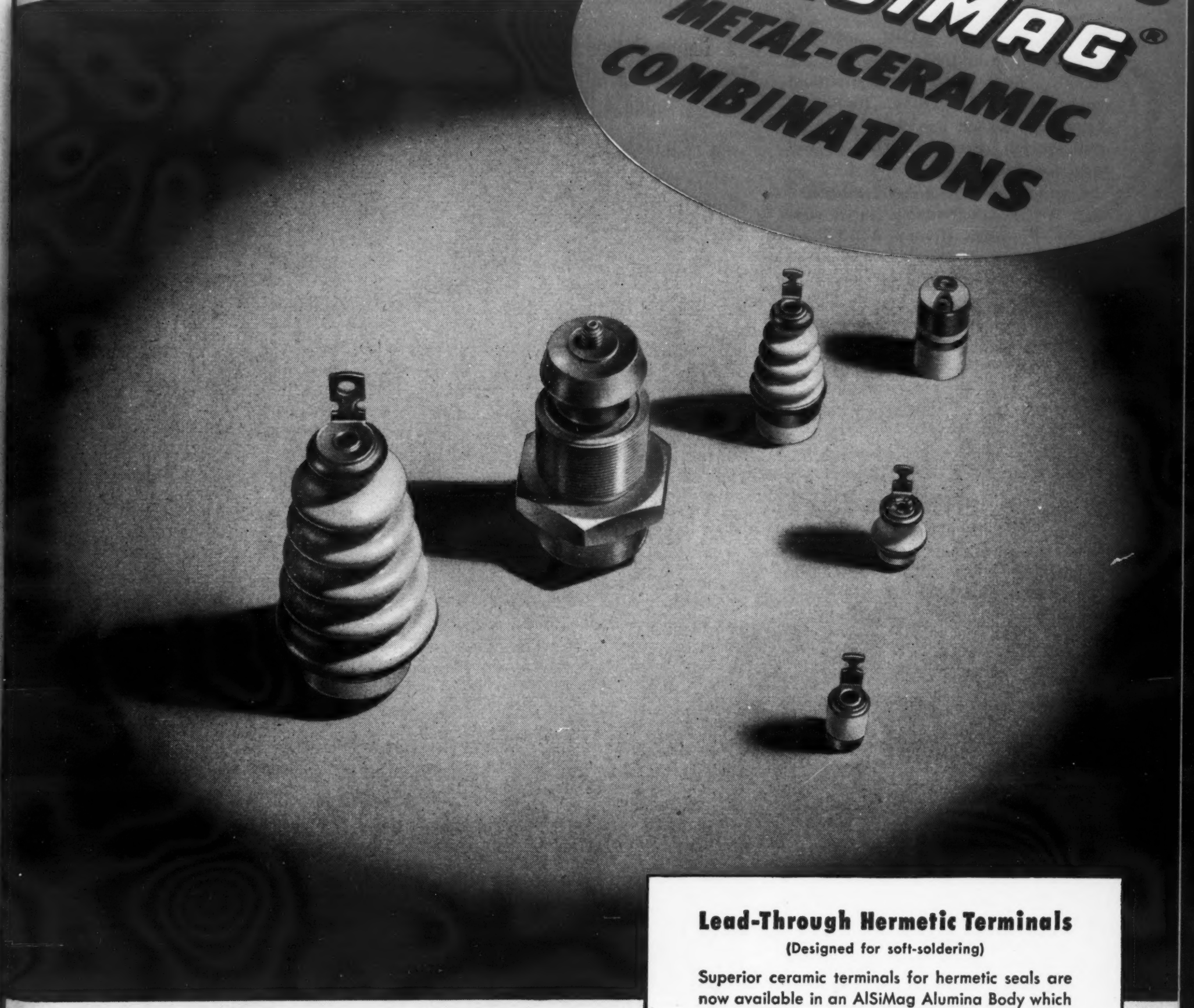
The Washington Mobile Radio Club spark-plugged the collection service of a recent Channel 5 telethon in Washington, D. S., conducted as a public service to raise money for the Muscular Dystrophy Association. Lieutenant Colonel E. S. Maloney (USMC) is president of the WMRC.

George Dixon, W3NZF, ardent mobile amateur radio operator, is president of the Washington chapter of the Muscular Dystrophy Association. It was his suggestion that mobiles could be used to collect money pledges as they were made.

The idea caught fire. Although the Washington Mobile Radio Club directed the operation many other amateurs participated. Non-mobile amateurs were used as second riders or control stations. All were furnished crystals from the mobile club's crystal bank. The club also provided each mobile and rider with credentials and operation instructions.

When the telethon got underway 60 mobiles and three control stations were completely equipped and ready to go. Although the program was telecast from the Lisner Auditorium of George Washington University, the main telephone operations were conducted from a downtown department store. From the store, leased wires ran to each control station. When a pledge was called in it was processed in normal telethon fashion, but if the amount pledged was more than a preselected arbitrary figure (which varied from time to time) the pledge went additionally to the amateur desk. Here it was telephoned to the appropriate control station. Control stations dispatched the nearest mobile to pick up the pledge. Accounting for pledges was accomplished by a numbering system similar to message numbers. When the pledge was collected the control station reported this information to the telephone center. Procedure was standardized. Transmissions were kept short.

AMERICAN LAVA CORPORATION... SPOTLIGHTS ALSIMAG® METAL-CERAMIC COMBINATIONS



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(Designed for soft-soldering)

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Some sizes and styles are carried in stock . . . or they can be custom made for your specific requirements. *STOCK ITEMS ARE SHOWN IN BULLETIN NO. 524, SENT ON REQUEST.*

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51ST YEAR OF CERAMIC LEADERSHIP

AMERICAN LAVA CORPORATION

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NEW ENGLAND: 1374 Mass. Ave., Cambridge, Mass., Kirkland 7-4498 • PHILADELPHIA: 1649 N. Broad St., Stevenson 4-2823 • ST. LOUIS: 1123 Washington Ave., Garfield 4959
CHICAGO: 228 N. LaSalle St., Central 6-1721 • SOUTHWEST: John A. Green Co., 6815 Oriole Dr., Dallas 9, Dixon 9918 • LOS ANGELES: 5603 N. Huntington Dr., Capital 1-9114

MARS

At first the mobiles were placed geographically by a system based on postal zones. This later was changed. In Washington, streets follow a numbering pattern which makes approximate location of any address instantly recognizable. The WMRC normally operates on four frequencies: 29520, 29560, 29600 kc plus the national emergency and calling frequency 29640 kc which is used for Auto-calls and squelch receivers. This proved ideal for the telethon net.

Control stations were established with W4CJJ on 29600 kc, area west of the Potomac River; W3EGI on 29560 kc, northern metropolitan area; and W3NL on 29520 kc, southern metropolitan area. The frequency 29640 kc was for calling and answering; later it was used additionally for a roving mobile which relieved assigned mobiles of accumulated pledge money.

One or two problems which can be expected in any such operation are cited as examples of planning vital to the success of a telethon collection net.

1. Telethon statistics, based on 13 previous telethons, showed that all activity ended about two hours after the telecast was completed. The telephone center was phased out of existence and a telephone answering service took over at 4 p.m. No provision was made for communication between the control stations and the answering service. Then the telethon failed to react as predicted. Business picked up instead of falling off and pledges continued to roll in. There was no link, however, to the mobiles.

2. Questions between control stations and mobiles were cleared up by use of 'dit-dahs" instead of phonetics since this method is believed by the Washington Mobile Club to be speedier and more reliable. Use of good c.w. operators on the leased lines from the telephone center to the control stations probably would have resulted in faster message transmissions.

3. Two-way communications is needed between the telethon master-of-ceremonies and the control stations. Many persons insist on seeing the MC announce their pledge prior to handing over the money.

4. Apart from the telephone center, a telephone usually has about 10 "show" phones which can and do accept pledge calls. They should have direct communication to the control stations.

5. A map board with pins representing mobiles and, if possible, receiving equipment for live demonstrations are valuable for use on the telethon show. This serves to inform and educate the public viewers on what amateur radio is doing, how it operates, and its role in collecting telethon pledges.

A Simple Method for Collins 32V Transmitter Operation on 4.020 MC and 4.025 MC

by WILLIAM M. AULD, A2DXD

Here is a tip that has been used to allow the 32V type Collins Transmitter VFO to operate up to 4.020 mc and 4.025 mc and not alter the accurate calibration of the VFO.

Open the top lid of the transmitter and observe the disc-like pieces on the shaft of the tuning control near the front panel. You will find a number of these discs stacked together. These discs have a small tab with a bent end that engage each other when rotated. If you carefully bend back the tab on the disc farthest from the front panel so it does not engage the one next to it you will be able to move the VFO control past 4.000 mc. Be careful not to turn the knob past the point where the condenser stops turning, but the frequencies 4.020 mc and 4.025 mc can be attained with ease.

It would be well to check your frequency against a crystal oscillator or BC-221 to zero beat the frequency; or zero beat A2USA or a net control station that is crystal controlled.

Very satisfactory operation has been obtained by this procedure on many transmitters.

(From MARS Bulletin, First Army)

Featurette

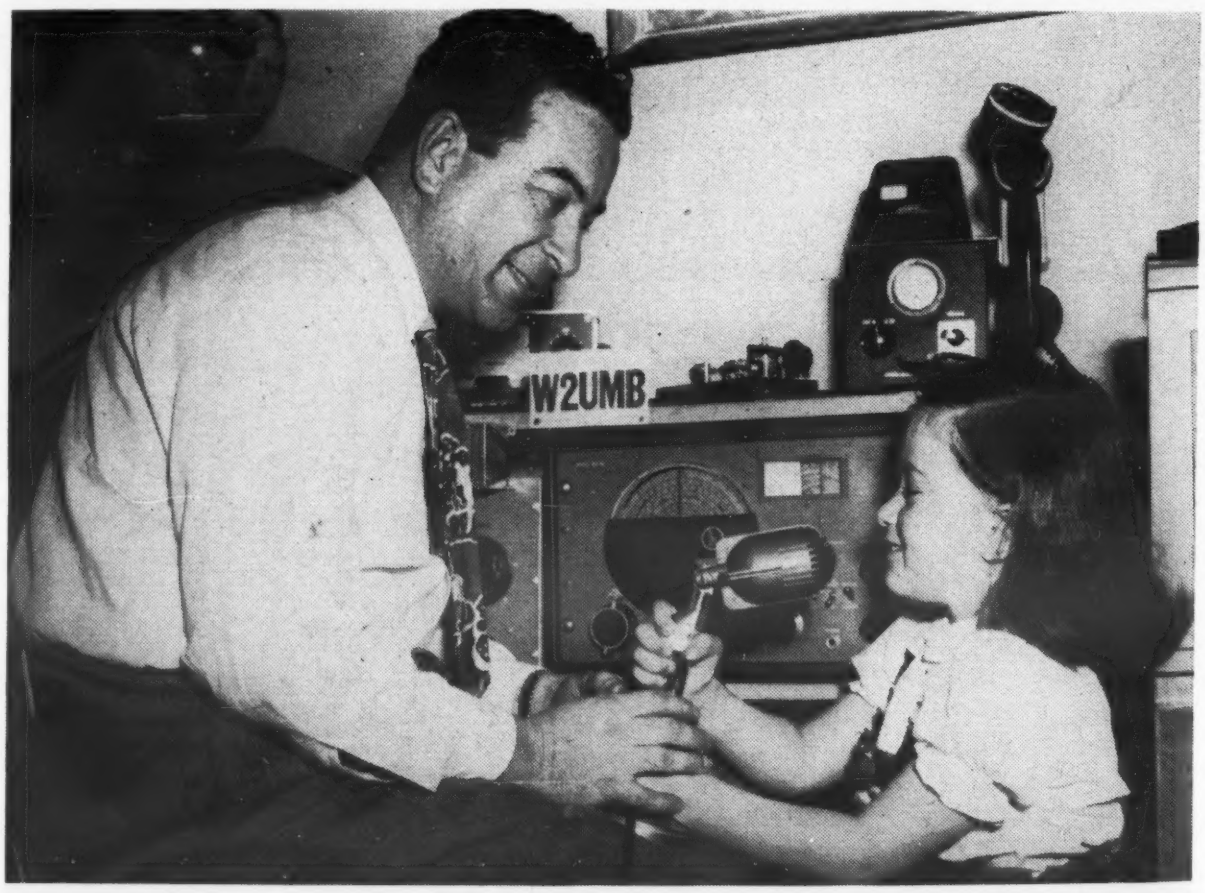
Little "Mike"

Many amateur radio operators begin when they are "barely" able to reach a set. That is when little Helene Meister, daughter of Leo Meister (W-2UMB) first showed interest in the equipment her father worked with so much.

Meister keeps a busy MARS schedule in the Air Force's emergency back-up nets in northern New Jersey after a hard day over hot communications gear with National Union Radio Corporation of Orange, N. J. He has been a communications "bug" since early boyhood and young Miss Meister seems to be well on the road to being just the same as she has graduated to the "mike."

We are looking forward to Miss Meister's application for membership in AFCA sometime in 1968.

Leo Meister shows his daughter Helene, now able to reach his set, some "tricks of the trade."



KNICKERBOCKER AMATEUR RADIO CLUB

The Knickerbocker Amateur Radio Club is located in the 9th Regiment Armory at 125 West 14th Street, New York. Radio operation is possible simultaneously on most amateur bands with the call W2KYN and MARS A2KYN. Regular meetings are held the first and third Thursday of the month and the club is open daily for members. Visiting hams and those interested in amateur radio are welcomed as guests at anytime.

An amateur license is required for membership and photostats of all members' licenses are posted in the clubroom. By means of a friendly competitive spirit, members are urged to advance themselves—novice-technicians soon become general class licensees and class A's become amateur-extras. All members of this club eligible to sit for the FCC highest amateur license—the amateur extra—have passed it. The age and occupations of members range from 1912 license holders to shaveless novices, and commercial operators to sign painters.

A workshop, complete from small tools to drill press, is maintained for members wishing to construct equipment. In the library are magazine files, reference books, manuals, call books, catalogues, etc., and at various intervals a club newspaper is printed.

VERMONT EMERGENCY

During December 1952, northern Vermont fell victim to one of the worst snowstorms in its history. Normal communications were completely disrupted and many towns were without heat and power for several days. As soon as telephone and telegraph services were disabled, the Naval Reserve Training Center at Burlington, Vermont, activated its amateur radio station, K1NAG. Among the 85 messages handled during the emergency were those for the railroads, the telephone company, and the Weather Bureau, as well as a few personal messages for members of the Armed Forces.

Amateur operators worked in relays at the Training Center's radio station under the supervision of Mr. Harold Drown, Vermont Section Emergency Coordinator for the American Relay League. These operators were:

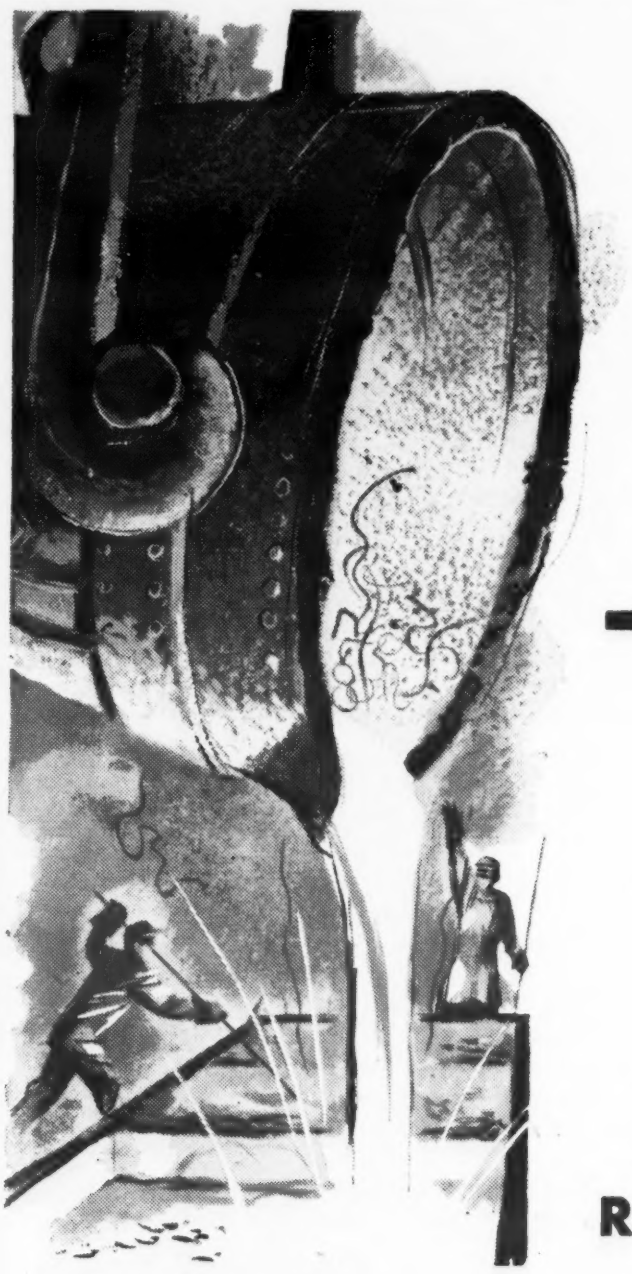
Burtis Dean, W1NCO;
Gordon A. Watson, W1QQN;
Harry Preston, W1VSA;
Hugh Karnes, W1QVS;
Robert Badger, W1VFZ;
Frederick L. Terrien, W1TLI;
James H. Viele, W1BRG.

Two transmitters were used and the radio station was operated from the Training Center's emergency power supply for 36 hours.

The communication service rendered by K1NAG, when all other means of communications had failed, was a vital factor in minimizing the confusion, loss, and discomfort to the many stricken communities.

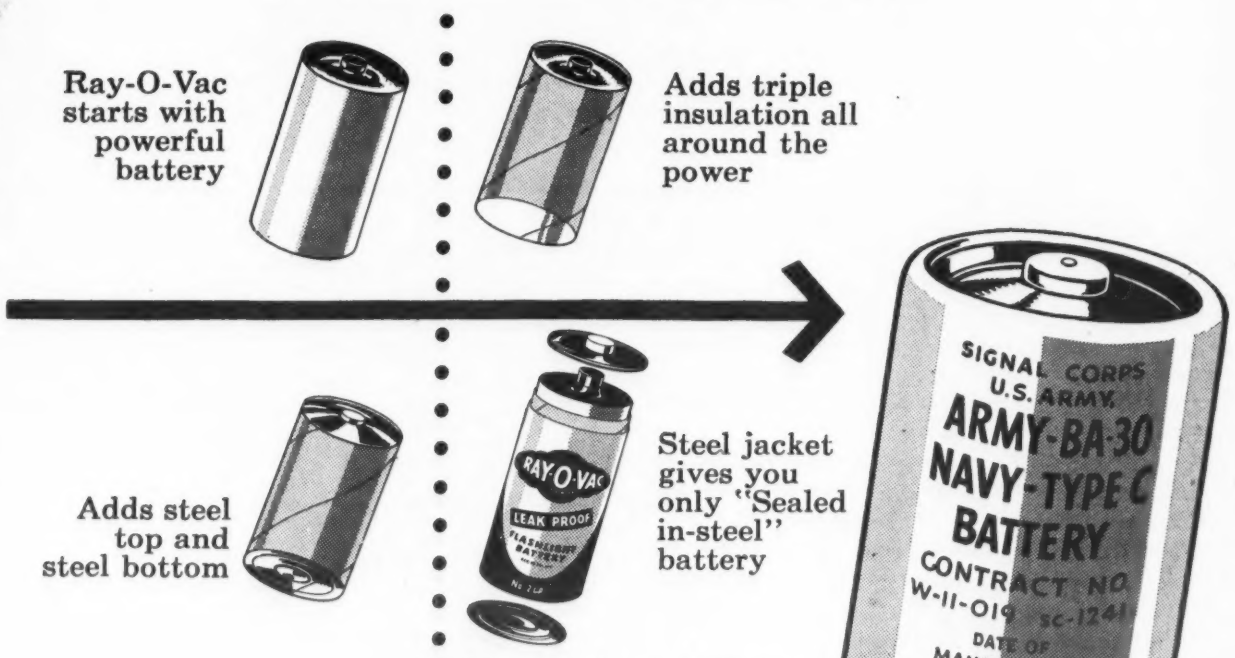
CORAL ISLE AMATEUR RADIO CLUB

The Coral Isle Amateur Radio Club of Guam, Marianas Islands (KG6-AAY), conducts semimonthly tests for all classes of amateur radio licenses. At present, the amateur radio station of the club is being rebuilt. A new console and rearrangement of the equipment are expected to provide more efficient operation of the station. Membership in the club is open to anyone interested in amateur radio, whether or not he holds an amateur operator's license.



STEEL *protects their power!*

Sealed-in-steel RAY-O-VAC LEAK PROOF batteries give best service!



It adds up to the most powerful battery you can use!

Sealed-in-steel Ray-O-Vacs stay fresh—stay strong . . . regardless of climate or age of battery. Easily the best dry batteries money can buy.

It's the BA-30 in the Signal Corps

RAY-O-VAC LEAK PROOF BATTERIES *stay fresh!*

Letters TO THE EDITOR..

Time Tested

Dear Sir:

I appreciate SIGNAL as I served in the Signal Corps from 1922 to 1928. In those days SIGNAL was just a mimeographed sheet. I am sure that the present handsome magazine is a fine influence on the cadets here at West Point.

Sincerely yours,
LT. COL. W. J. MORTON
Librarian, USMA
West Point, N. Y.

Change

Colonel Dixon:

. . . have noticed a very definite change in the format of SIGNAL—and like it! Thanks.

NORMA TESTARDI
Philadelphia Chapter

"Doing It the Hard Way"

Gentlemen:

. . . Marconi Magnetic Detector. I worked on several British ships during World War I that used this detector, it was necessary to wind it every two hours as it ran by clockwork. Period 1915 to 1917.

MAURICE RUSHWORTH
531 South Longwood St.
Baltimore, Md.

History in the Making

Editor:

The "Magnetic Detector" shown on page 28 of the Jan.-Feb. issue of SIGNAL is usually thought to be an invention of Marconi, and replaced the "coherer" as standard equipment on hundreds of Marconi Wireless equipped ships . I have listened to and repaired hundreds of them. Although ridiculed by the American wireless companies as an insensitive and crude device it actually was the most reliable "detector" ever put on a ship. During World War I it was extensively used on British battleships because it operated perfectly in spite of the shock of big guns firing, when crystal receivers, early forms of Fleming Valves and DeForest Audions were shattered to bits by the concussion of the big guns. Likewise the early forms of thin-platinum wires dipping into a cup of acid were useless. (Electrolytic)

It was particularly good when used to receive "long-wave" signals, 10,000 meters or longer. Dave Sarnoff used one when he was the operator at the old Marconi station at Sea-Gate, New York harbor, and he never felt too sorry about it.

The endless rope of silk-covered soft iron wires was rotated by clock-work, which had to be wound up with a big brass key. When the main-spring broke the operator who had neglected to have a spare clock-work motor in his locker, had the task of turning the ebonite wheel with a little knob while he copied code with his right hand. One lazy and ingenious lad rigged up a belt-drive to his electric fan and forever after did most of his operating that way.

The "Multiple Tuner" was often called a Franklin Tuner and did a splendid job, (for those days).

How do I know all this. . . I was the Chief Inspector of the old American Marconi Co. and lived with the stuff, and had sincere respect for the sturdy construction that went into the tuner and the old "Maggie."

Your technical description of the Maggie is quite accurate, however you neglected to state that the continuous loop of iron wires was made up of a large number of individually insulated wires slightly twisted and that there was a continuous circuit, the beginning of the coil was joined to the end, it was quite inefficient if not made that way.

PERCE B. COLLISON
9 Lorraine Drive
Tuckahoe, N. Y.

Dear Sir:

It was a little tougher this time. The best I can afford for the developer of the Magnetic Detector described by Colonel Ransom is that his name is Marconi (the Marconi, of course) and he first used it June 25, 1902 on the Italian cruiser "Carlo Alberto."

Once again, SIGNAL is really filling in with material of real value.

FRANCIS S. DUNN
W8DTR
Dayton, Ohio

A Request

If any reader knows how or where to locate a copy of "Principles of Radio Communication" by J. H. Morecroft, preferably the 3rd Edition, will you please notify Mr. Francis S. Dunn at the following address R.R. 5, Box 923, Dayton 4, Ohio. Thank you.

Young Marconis

Dear Editor:

The interesting article "Doing It The Hard Way" by Colonel Ransom instantly brings to mind my days as a youth in New Zealand. I was one of a trio known to all as the young Marconis. In those days Her Majesty's and later His Majesty's Navy had undisputed license and control of the "Ether" over British soil. New Zealand is a pioneering country, or rather was in those days, and the only source of telephone receivers, relays, etc. was from the government owned Telephone and Telegraph offices, and likewise, any wire, burnt out field coils—storage batteries a youngster could secure was from the scrap heap of the electric power company, or some automobile agency.

With equipment salvaged from scrap piles, the young Marconis pioneered amateur wireless in the southern "Dominion." With the aid of a homemade "Marconi Magnetic Detector," a pair of head phones fashioned from two 100 ohms Ericson receivers weighing almost a half pound, we, with the cooperation of regular New Zealand government telegraphers, staged a public demonstration which has been recorded in the annals of the New Zealand parliament as the first communication publicly announced in that area over land and water without wires.

His Majesty's ships, and I remember one in particular HMS Pioneer, carried Marconi spark equipment in those early days . . . . this is a wonderful age of progress we live in.

R. E. STARK, Vice Pres.
Stupakoff Ceramic and Mfg.

Overseas

Dear Sir:

I am now stationed in Korea; have not been able to find out if there is an AFCA Chapter in the vicinity. Please let me know if there is one hereabouts. I think AFCA is a fine organization and your magazine, SIGNAL, is one of the finest.

I eagerly await your answer and my next copy of SIGNAL.

ROBERT G. HENDERSON
Captain, SigC

College Student

Dear Editor:

Just want to let you know how helpful your bi-monthly publication, SIGNAL, is to a college student, majoring in physics and math.

My eventual goal is to do research work in the everwidening field of electronics. Many thanks.

ALLAN MCPHILLIPS
Seattle, Washington

On the Move

When you change your address, please notify our Circulation Department immediately so that we can keep our records up to date and follow you with SIGNAL and the NEWSLETTER.

Hughes cooperative plan for

MASTER OF SCIENCE DEGREES

Purpose **TO ASSIST** outstanding graduates in obtaining their Master of Science Degrees while employed in industry and making significant contributions to important military work.

Eligibility Eligible for application are members of the armed services being honorably discharged prior to September, 1953, holding degrees in the following fields:

ELECTRICAL ENGINEERING
PHYSICS
MECHANICAL ENGINEERING

Those chosen to participate in this plan will be from the upper portion of their graduating classes and will have evidenced outstanding ability. They must also have displayed some degree of creative ability and possess personality traits enabling them to work well with others.

Citizenship Applicants must be United States citizens, and awards will be contingent upon obtaining appropriate security clearance, as work at the Hughes Research and Development Laboratories may be related to National Defense projects.

Universities Candidates for Master of Science Degrees must meet the entrance requirements for advanced study at the University of California at Los Angeles or the University of Southern California.

Program Under this Cooperative Plan, commencing June 1953, participants will follow this schedule of employment at Hughes:

FULL TIME—from June, 1953 to Sept., 1953.
HALF TIME—from Sept., 1953 to June, 1954.
FULL TIME—from June, 1954 to Sept., 1954.
HALF TIME—from Sept., 1954 to June, 1955.

Recipients will earn five-eighths of a normal salary each year and attend a university half time during regular sessions working on their Master's Degree.

Salaries The salary will be commensurate with the individual's ability and experience, and will reflect the average in the electronics industry. Salary growth will be on the same basis as for full-time members of the engineering staff. In addition, the individuals will be eligible for health, accident, and life insurance benefits, as well as other benefits accruing to full-time members.

Travel and Moving Expenses For those residing outside of the Southern California area, actual travel and moving expenses will be allowed up to ten per cent of the full starting annual salary.

Sponsorship Tuition, admission fee, and required books at either the University of California at Los Angeles or the University of Southern California, covering the required number of units necessary to obtain a Master's Degree, will be provided by Hughes Research and Development Laboratories.

Number of Awards Approximately one hundred Cooperative Awards are made each year, if sufficient qualified candidates present themselves.

Selection of Candidates Candidates will be selected by the Committee for Graduate Study of the Hughes Research and Development Laboratories.

Application Procedure Application forms should be obtained immediately. Completed applications must be accompanied by college transcripts.

Address correspondence to

COMMITTEE FOR GRADUATE STUDY

HUGHES
RESEARCH
AND DEVELOPMENT
LABORATORIES

Culver City, Los Angeles County, California

Coast Guard Ocean Stations

(*Continued from page* 12)

(i) All Ocean Station Vessels are prepared to communicate on appropriate "scene of air sea rescue" frequencies in conformance with Coast Guard, Joint, or Combined search and rescue frequency plans.

(j) All Ocean Station Vessels are prepared to communicate on appropriate ship-shore search and rescue control or coordinating frequencies in conformance with Coast Guard, Joint, or Combined search and rescue frequency plans. (The Coast Guard high frequency circuits are also used for passing traffic other than that pertaining to search and rescue).

(k) All Ocean Station Vessels are equipped with radio direction finders capable of obtaining bearings on signals from 250 to 1500 kcs.

The ability to attain rapid and reliable search and rescue communications is dependent upon a number of factors:

(a) Suitable frequencies clear of harmful interference must be available.

(b) Suitable and dependable transmitters and receivers must be provided, and maintained.

(c) Adequate antenna systems must be provided and maintained.

(d) Search and rescue communication plans must be standardized to the maximum practicable extent and must not be complicated by non-essential circuit requirements. In this connection the Coast Guard continuously strives to achieve a "common" plan which will be adaptable for use for search and rescue operations involving merchant vessels, civil aircraft, military vessels, and military aircraft in distress.

(e) Voice and CW procedures must be standardized.

(f) Circuit discipline must be maintained.

(g) Simplex circuits are considered essential.

Equipment

The electronic equipment aboard a U. S. ocean station vessel is as varied as the duties the vessel must perform. Installed are ten transmitters with a combined frequency range of 200 kcs to 400 megacycles for ship to shore, air to ship and ship to ship communications and radiobeacon transmission; nineteen communication receivers; one radiosonde receiver and recorder; two complete radar equipments for air and surface search; fire control radar; radar repeaters; complete sonar gear; a recording fathometer; a medium frequency radio direction finder; and a loran receiver.

As the U. S. Ocean Station Vessels are small armed ships varying in length from 255 to 327 feet, the problems of finding suitable space for electronics equipment and antenna structures and of suppressing local spurious and harmonic interference are most difficult. However, Coast Guard electronic engineers have been able to meet all requisite operational requirements to the satisfaction of operational commands.

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Riding the Range a la '52

(*Continued from page* 27)

past five years, several V-2 rockets and over twenty Aerobees, fully instrumented with scientific equipment of unusual design, have been launched into the upper reaches of the atmosphere to collect data on temperature, winds, and composition of stratospheric gases.

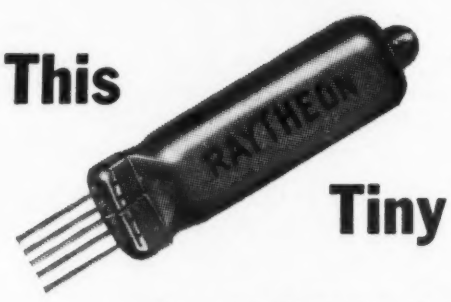
The peculiar scientific hazards of this type of research can be appreciated when one considers for a moment that many of the measurements must be made on the run—from a rocket travelling nearly 3000 feet per second—and in a tenuous atmosphere whose pressure, at the heights attained, is about 1/10,000 of a pound

(*Continued on page* 76, *col.* 1)

RAYTHEON

Excellence in Electronics

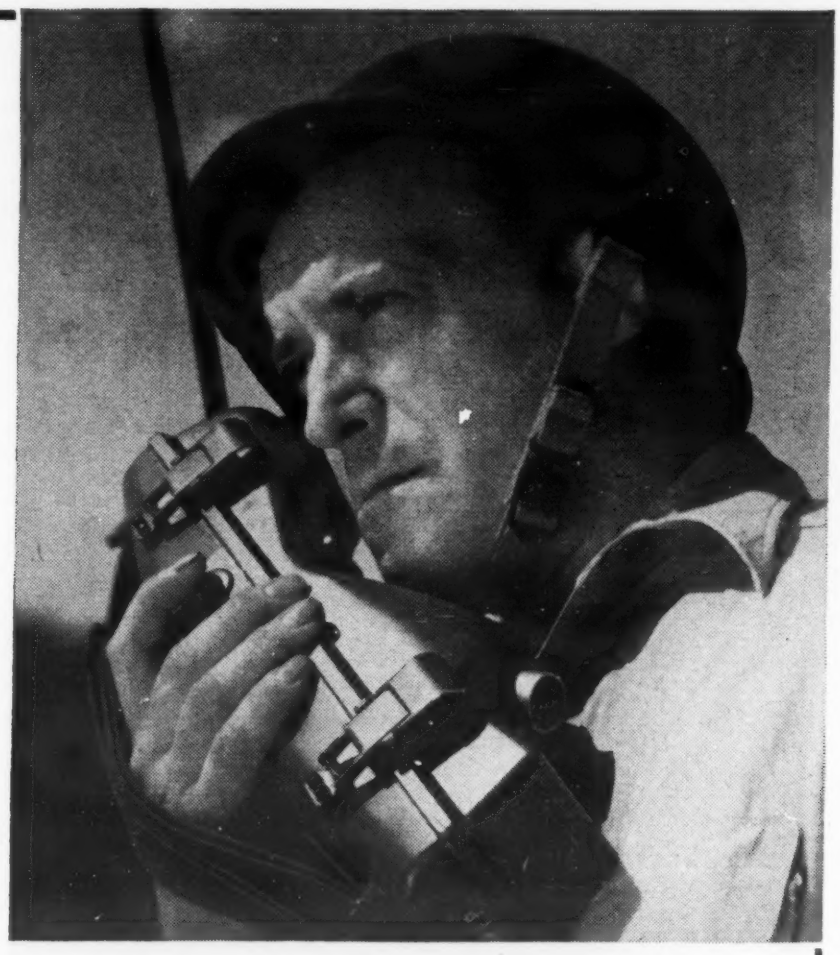
From This



Tiny Tube...

A HARVEST OF HAND RADIOTELEPHONES

The subminiature tube, a Raytheon development, made possible this lighter, more compact hand transmitter-receiver AN/PRC-6. Raytheon developed and is mass-producing this equipment . . . another Raytheon contribution to improve the effectiveness of our Armed Forces.



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...any quantity and any size

Wound from precision rolled oriented silicon steel strip as thin as .00025"

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For users operating on government schedules, Arnold is now producing C-Cores wound from ¼, ½, 1, 2, 4 and 12-mil Silectron strip. The ultra-thin oriented silicon steel strip is rolled to exacting tolerances in our own plant on precision cold-reducing equipment of the most modern type. Winding of cores, processing of butt joints, etc. are carefully controlled, assuring the lowest possible core losses, and freedom from short-circuiting of the laminations.

We can offer prompt delivery in production quantities—*and size is no object, from a fraction of an ounce to C-Cores of 200 pounds or more.* Rigid standard tests—and special electrical tests where required—give you assurance of the highest quality in all gauges. ● *Your inquiries are invited.*

THE ARNOLD ENGINEERING COMPANY

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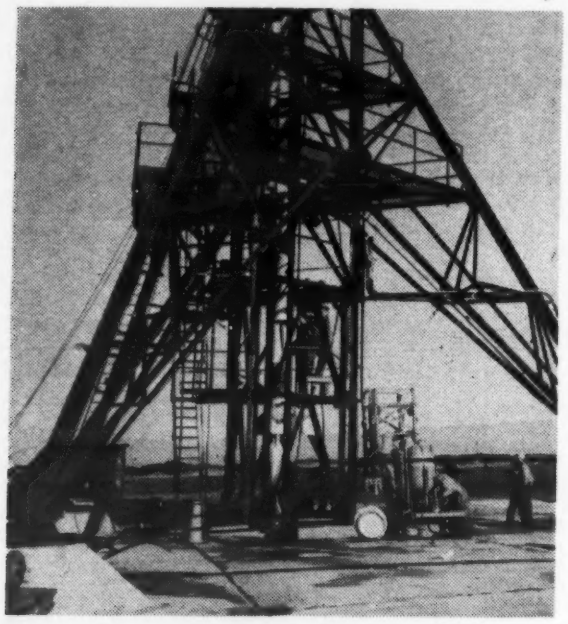
Riding the Range a la '52

(*Continued from page 74*)

per square inch! In spite of many disheartening disappointments, techniques have been evolved and precious scientific-data collected.

The Signal Corps' technique for temperature measurement is simple and elegant; a technique based upon a measurement of the velocity of sound. The point-source of sound is a specially designed high-explosive, high-flash grenade ejected from the rocket at predetermined heights. About seven grenades are carried by an Aerobee. The basic data collected at the ground are the time of explosion, time of arrival of the sound, and the position of the exploding grenades.

Data, that are now available, reveal a most interesting picture of the vertical structure of the atmosphere at White Sands. In a broad sense, the vertical temperature-field has several maxima and minima, suggesting a rather marked temperature stratification. As shown in the temperature chart, the average temperature varies from a ground value of about 17°C. to —75°C. at 50,000 feet and increases through the ozone layer to a maximum of about 0°C. at 150,000 feet; the temperature again decreases to a value of —80°C. near 260,000 feet; from this point upward the data are sparse but do indicate a marked rise in temperature to values in excess of several hundred degrees.



The above photo shows an overall view of the rocket in launching tower with acid loading operation displayed.

Of exceptional scientific importance are the data collected on the night of 12 December 1950. Two Aerobee rockets were fired five hours apart in order to detect any diurnal variation in temperature. The data reveal no significant temperature changes from the ground to 190,000 feet; however, at about this height the temperature dropped nearly 20° within the five-hour interval. It has been deduced that this anomalous decrease in temperature was not due to radiational cooling, but rather to advection at 190,000 feet of very cold air from the southwest.

From these same data it has been possible to compute the winds at high altitudes. The computations show that during the summer, the upper winds are from the east at all levels measured (up to 270,000 feet) and from the west during the winter. The winds are variable in strength and on the average of greater value than those in the lower atmosphere. Speeds in excess of 200 mph were measured. A rather sudden wind-direction change of nearly 90 degrees was noted at 190,000 feet during one firing.

As part of a cooperative plan with the Signal Corps, the scientists of the University of Michigan have succeeded in obtaining samples of air up to heights of 225,000 feet. The scientific problem was to determine the chemical composition of these stratospheric samples and ascertain whether the mean composition of the air changes with height. The evidence from one of many flights is sufficiently definitive to conclude that at about 225,000 feet the gases were beginning to separate in accordance with their molecular weights. This represents the first piece of direct positive evidence of diffusive separation of the gases.

The data accumulated from rocket firings, within the past few years, have greatly increased our understanding of the upper atmosphere, nevertheless, information is lacking on diurnal changes and on the variation of these basic thermodynamic data with geographic latitude. Buck will bring home the bacon, tho, I bet you!

"Oh! Give me a home, where the Aerobees roam."

The old days are gone forever—*that's for sure!*

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WTE Calling

(*Continued from page 21*)

The impossible, if it existed in those war years, was ignored or overcome in passing. But one thing remained. The old car fostered a dream, a car with no faults from either a communications or railroad standpoint. Something to which the Army Signal Corps could point with pride. In 1949 action was taken and in 1952 such a car was delivered. The General Albert J. Myer, S. C. #1 was accepted. This car has six-wheel trucks with roller bearings, sound-proofed rooms, an engine room housing 100-kw of Diesel power, a central control console, tape recording equipment, many electrical and mechanical refinements such as Q flooring, air conditioning, intercom between the rooms, Bell System ship-to-shore telephone, and antennas that will take a 3-kw input from the reliable 339 transmitters. There are still a few rough edges to this custom-built car but almost ten years of trial and error and research went into its construction. It looks as though any President will be satisfied that when on or near a railroad on the American continent, he will lack swift, clear or coded message handling limited only by the state of the art.

Of course, new things are on the fire in the laboratories and maybe someday even this car ———. But then isn't that typical of that family with Necessity for a Mother and Communications a Precocious child?

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Doing It the Hard Way

(*Continued from page 19*)

frequency can be varied over a wide band. Then, by varying the exciter frequency, the band is still further extended. With further extensions via Joly-Arco doublers, triplers and quadruplers, the entire low frequency spectrum is at your feet.
What more could you ask?

* * * *

As usual, send your answer to Dept. X, in care of SIGNAL, and tell us why it won't work.

* * * *

And so, in closing this series of articles which has plagued these pages for the past twelve-months, I feel that I have presented the ultimate in "DOING IT THE HARD WAY." But then, I wonder—?

One last word: it is only because of the great kindness of Mr. Elmer E. Bucher—one of the Grand Old Men of Wireless—that we've had this past year's sport. Back in 1918 when Mr. Bucher was practically its entire teaching staff, the Marconi Institute accepted my enrollment as a student. During school hours I listened to his exposition of theory and practice. At night I pursued decrement and wavelength through the pages of his "Practical Wireless Telegraphy." A little more than a year ago I approached my mentor with the request that he permit me to use his old text as material for this series. When he consented—both promptly and graciously—I thanked him and shamelessly embarked upon this pleasant piratical voyage we've just ended. Now I want to say "Thanks" again.

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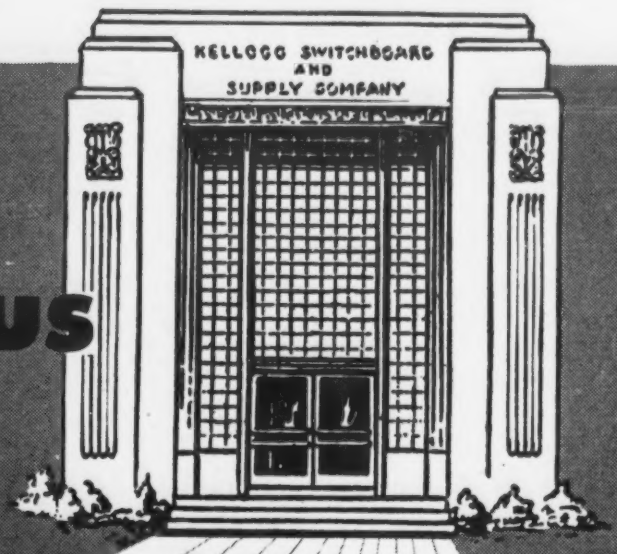
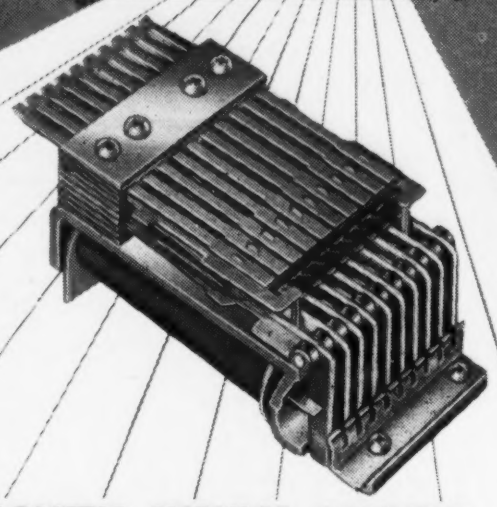
doorway to better apparatus



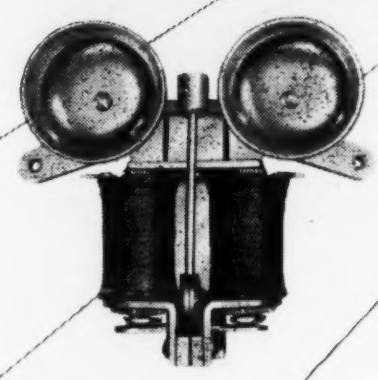
KELLOGG

manufactures a quality line of communication products for telephone and electronic applications...



MAGNETIC IMPULSE COUNTER

Simple! Saves space! Saves money! . . . Actuated by electrical impluses — performs the counting and marking function of a chain of 10 to 20 relays or of a two-magnet ten-point stepping switch. Noted for long life and top reliability!

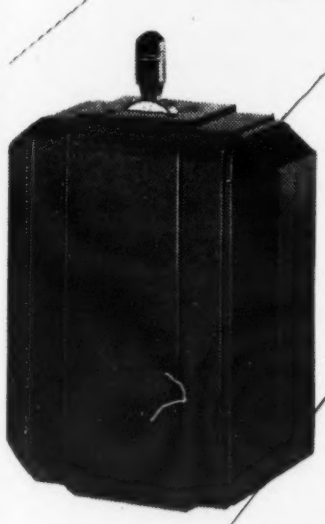


FREQUENCY SELECTIVE RINGERS

High impedance — for each of the frequency Selective Series, Harmonic, Synchromonic and Decimonic. Reduces excessive current drain on short loops. Improves ringing on long heavily loaded loops.

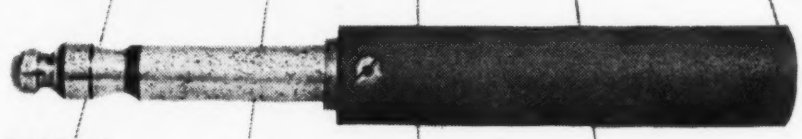
KELLOGG DIAL

For all types of instruments. Noted for high efficiency, good looks and simplicity. Furnished with various types of number plates. Quiet in operation. Precision built to highest standards. Long lasting and economical!



KEY BOX

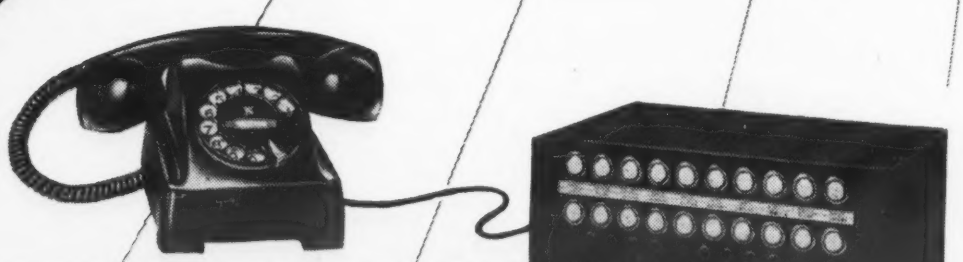
Compact, attractive. Used to switch a telephone between two incoming trunk lines and to hold one line while using the other for intercommunication. No auxiliary equipment required. Sturdy black Bakelite cover.



PLUGS

Kellogg manufactures all types of plugs — operator's, switchboard and wall outlet. Made to give maximum service. Tips are of brass, and hard rubber insulation is used. All connections protected by fibre sleeve.

Investigate KELLOGG Key BX System



HAND SETS

Kellogg's famous handsets are of two basic types—metal housing and Bakelite housing. Both have the special Kellogg Non-Positional transmitter and bi-polar type receivers using cobalt magnets. Furnished with cords attached.

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SALES OFFICE: 79 W. Monroe St., Chicago 3, Illinois

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GOVERNMENT PURPOSE RADIO AND INSTRUMENT HOOK-UP WIRE,
plastic or braided type, conforming to Government Specification JAN-C-76, etc., for radio and instruments. Solid or flexible conductors, in a variety of sizes and colors.

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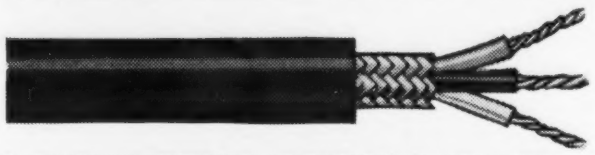
Underwriters Approved, for 80° C., 90° C. and 105° C. temperature requirements. Plastic insulated, with or without braids.

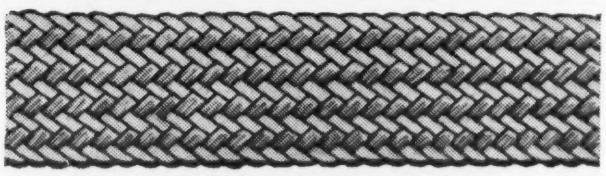


SHIELDED JACKETED MICROPHONE CABLE
Conductors: Multiple—2 to 7 or more conductors of stranded tinned copper. Insulation: extruded color-coded plastic. Closely braided tinned copper shield. Tough, durable jacket overall.

RF CIRCUIT HOOK-UP AND LEAD WIRE
for VHF and UHF, AM, FM and TV high frequency circuits. LENZ Low-Loss RF wire, solid or stranded tinned copper conductors, braided, with color-coded insulation, waxed impregnation.

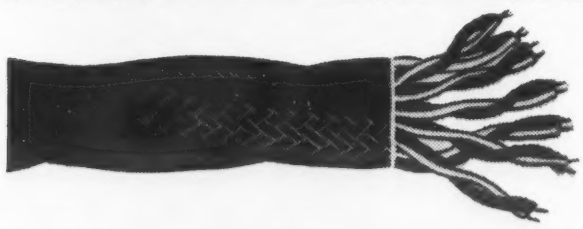
JACKETED MICROPHONE CABLE
Conductors: Extra-flexible tinned copper. Polythene insulation. Shield: #36 tinned copper, closely braided, with tough durable jacket overall. Capacity per foot: 29MMF.

SHIELDED MULTIPLE CONDUCTOR CABLES
Conductors: Multiple—2 to 7 or more of flexible tinned copper. Insulation: extruded color-coded plastic. Closely braided tinned copper shield. For: Auto radio, indoor PA systems and sound recording equipment.



TINNED COPPER SHIELDING AND BONDING BRAIDS
Construction: #34 tinned copper braid, flattened to various widths. Bonding Braids conforming to Federal Spec. QQ-B-575 or Air Force Spec. 94-40229.

SHIELDED COTTON BRAIDED CABLES
Conductors: Multiple—2 to 7 or more of flexible tinned copper. Insulation: extruded color-coded plastic. Cable concentrically formed. Closely braided tinned copper shield plus brown overall cotton braid.



PA AND INTERCOMMUNICATION CABLE
Conductors: #22 stranded tinned copper. Insulation: textile or plastic insulated conductors. Cable formed of Twisted Pairs, color-coded. Cotton braid or plastic jacket overall. Furnished in 2, 5, 7, 13 and 25 paired, or to specific requirements.

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Actual size shows compactness and high quality construction

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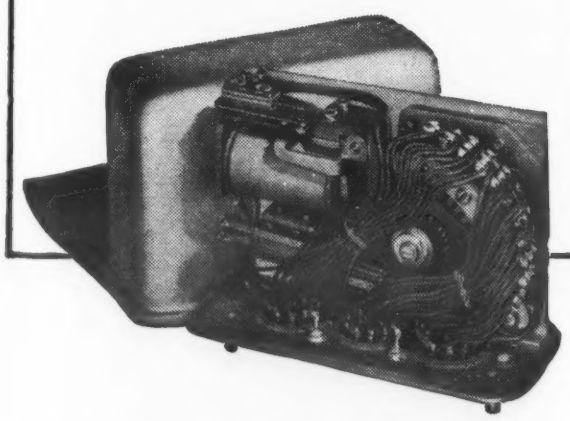

***Switches, too,** are hermetically sealed! This compact Type 44 Rotary Switch assembly is only 3⅛" by 4 11/16" by 2 3/16". One shown provides three bank levels — 10 points plus home. Six levels also available.*

Automatic Electric encloses *entire* relay circuits in single hermetically sealed units. Every component, the wiring, the connections—all are protected from dust, moisture, tampering, atmospheric changes . . . operating in their own atmosphere of dry, inert nitrogen gas.

Name the conditions under which your relays have to operate; Automatic Electric will engineer exactly the unit to do the job—in a compact enclosure of the proper size and design.

Individual sealed relays are also available in a wide variety of enclosures, and with terminal connections to meet your specifications. Whether industrial or military, your product will be most dependable with Automatic Electric hermetically sealed relays. Write for details:

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SELENIUM RECTIFIERS

Full-Wave Bridge Types

Current (Continuous)	18/14 Volts	36/28 Volts	54/42 Volts	130/100 Volts
1 Amp.	$1.35	$2.15	$3.70	$7.50
2 Amps.	2.20	3.60	5.40	10.50
2½ Amps.	.....	.....	6.00	13.00
4 Amps.	4.25	7.95	12.95	25.25
6 Amps.	4.75	9.00	13.50	33.00
10 Amps.	6.75	12.75	20.00	40.00
12 Amps.	8.50	16.25	25.50	45.00
20 Amps.	13.25	25.50	39.00	79.50
24 Amps.	16.25	32.50	45.00	90.00
30 Amps.	20.00	38.50	.....	.....
36 Amps.	25.00	48.50	.....	.....

● New Selenium Rectifier Transformers

PRI: 115 V., 60 cycles in.
SEC: 9, 12, 18, 24, and 36 volts
Continuous Ratings

4 Amps.....$ 8.75
12 Amps..... 16.75
24 Amps..... 35.75
50 Amps..... 59.75

● New Selenium Rectifier Chokes

4 Amps.—.07 Hy.—.6 ohm.....$ 7.95
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We can manufacture other Selenium Rectifiers, Selenium Rectifier Supplies, XFMRS., & Chokes

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● 115V. PRI—5V. @ 190 Amp. SEC.....$49.95

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0D3/VR150	.88	6F8-G	.85	F-123A	6.50
1A7GT	.89	6G6-G	.85	211(GE)	.75
1AE4	.90	6J5GT	.45	250-TH	17.00
1B3/8016	.80	6J6	.62	274A&B	2.95
1B23	8.00	6J7	.70	275-A(WE)	3.00
1B27	12.50	6K4(Syl.)	3.50	304-TH	7.00
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1N34A	.75	6L7	.80	359-A(WE)	4.00
1N44/400B	1.21	6N7-Metal	.80	371-B	.85
1N45/400C	1.39	6Q7GT	.80	373-A(WE)	4.00
1N48(GE)	.55	6S7Metal	.98	374-A(WE)	3.50
1N54(Syl.)	.77	6SD7	.79	387-A(WE)	2.50
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2C43(GE)	13.95	6SK7GT (Syl.)	.62	407-A(WE)	5.00
2C52	5.50	6SL7GT	.60	408-A(WE)	2.75
2E24	2.50	6SN7GT	.70	421-A(WE)	3.50
2E30	1.95	6V6GT	.55	GL-464A	8.95
2J22	6.50	6W4GT	.55	717-A	.88
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2J39	40.00	6X5GT	.55	807	1.59
2J48	24.25	7A7	.69	811-A	3.50
2K25	29.50	7A8	.69	812	2.70
3A4	.59	7C5	.69	812-A	3.50
3API	9.00	7C6	.69	816	1.10
3B28	7.50	7C30	85.00	832-A	8.50
3B29	9.95	7F7	.69	837	1.45
3BPI	5.75	7H7	.72	860	3.95
3BPII	9.50	12A6	.50	861	15.00
3C23(GE)	9.50	12AT7	.75	866A (Hytron)	1.55
3C24/24G	1.90	12AU7	.62	872-A	3.95
3C27	7.50	12AV6	.49	959	2.75
3C33	9.00	12AX7	.79	1613	.75
3D6/1299	.50	12BA6	.57	1616	.70
3E29	9.95	12BD6	2.10	1622(6L6M)	1.95
3Q5GT/G	.99	12BE6	.57	1625(RCA)	.35
3S4	.80	12BH7	1.15	1631	.70
4-125A	22.00	12SA7	.75	1632	.70
4-250A	32.00	12SF5	.70	2050(RCA)	1.35
4X150A	25.00	12SG7	.80	2051	1.10
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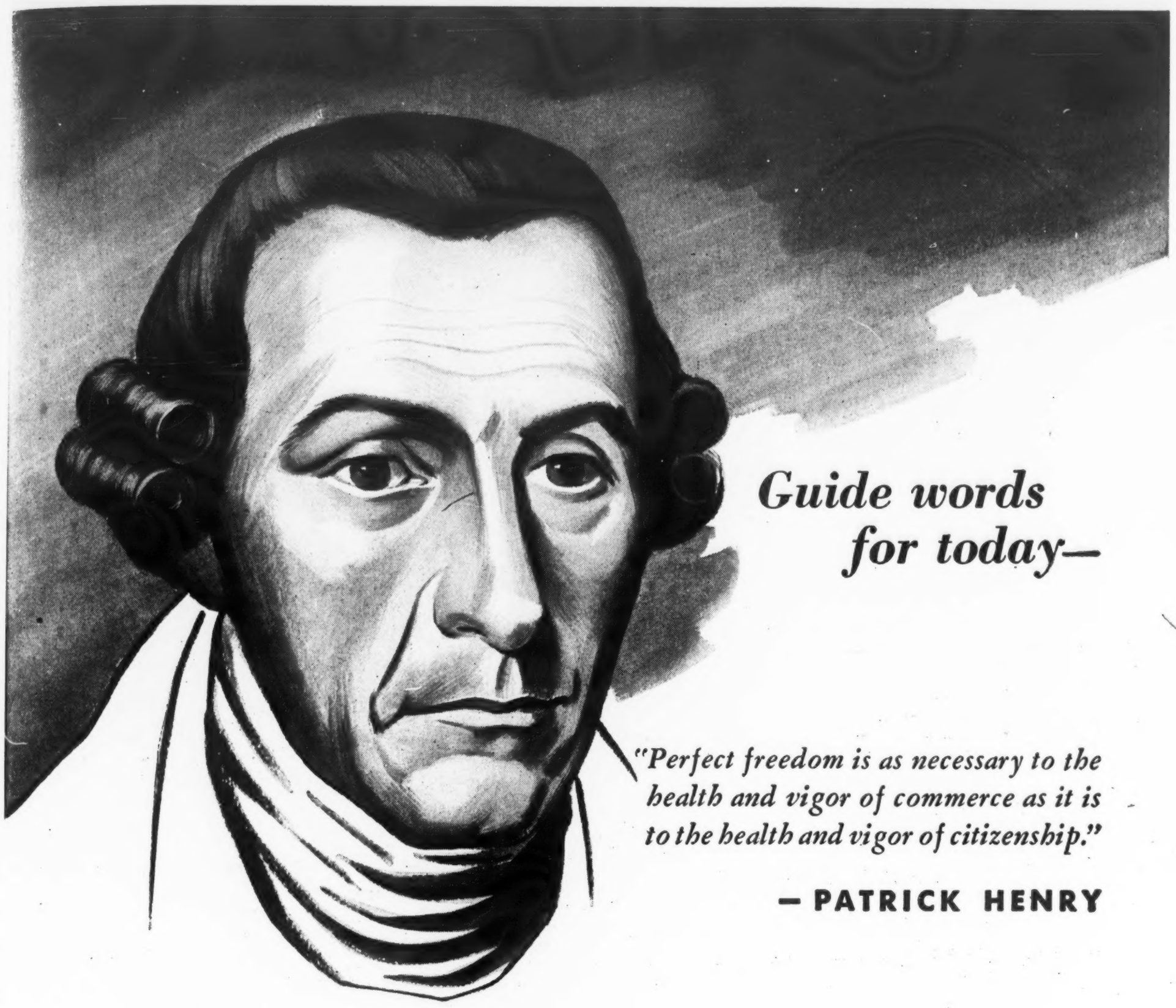

Guide words for today—

"Perfect freedom is as necessary to the health and vigor of commerce as it is to the health and vigor of citizenship."

— PATRICK HENRY

Patrick Henry had a precise understanding of freedom's meaning. "Perfect" freedom, whether for commerce or individuals, was not a license to harm others, or to disregard laws. It did include, however, the right to make decisions, to manage, to control one's affairs without undue government interference.

The health and vigor of America's citizenship and commerce are what made this nation great. But individuals are robbed of their self-reliance when they lean too heavily on government. And business concerns lose their vitality when bureaucratic regulations restrict their ability to plan imaginatively . . . and to execute those plans courageously.

"Perfect freedom" in its true sense is more important today than ever . . . as the entire free world looks to America for leadership and example in the fight against tyranny.

W B Stuart

President

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The Gray Manufacturing Company, Hartford 1, Connecticut

Makers of Audograph and PhonAudograph Electronic Soundwriters

AND GRAY RESEARCH AND DEVELOPMENT CO., INC., SPECIALISTS IN VIDEO, AUDIO, SUB-AUDIO ELECTRONIC MECHANISMS

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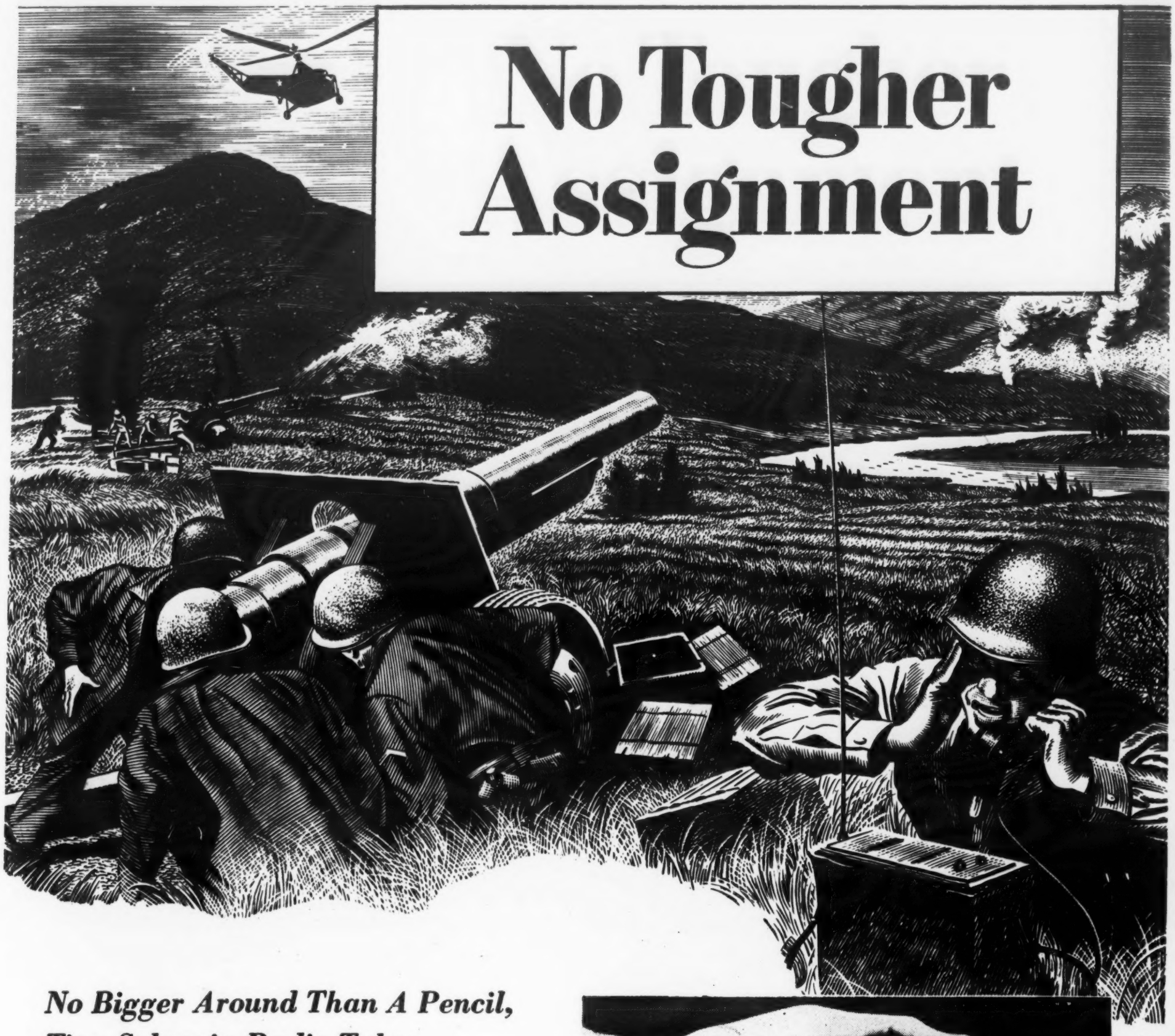

No Tougher Assignment

No Bigger Around Than A Pencil, Tiny Sylvania Radio Tubes Serve The Armed Forces

To our Armed Forces, electronic devices are a matter of life or death. They are vital to communications and give deadly accuracy to gunfire.

Jarring shocks, intense vibration, high temperatures are the destructive conditions which confront the very heart of this equipment—the electronic tube.

Sylvania engineers developed tubes *rugged* enough to meet these battle conditions, yet *small* enough to fit into necessarily lightweight, compact military equipment.

Precision engineered and quality tested, these tubes meet the toughest of military and civilian application. *They are another example of the engineered high quality of Sylvania products—quality which results from pace-setting research and engineering over half a century, and which works constantly to meet the needs of the future.*

Sylvania's "premium performance" subminiature tube—only 2½ inches long and no bigger around than a pencil.

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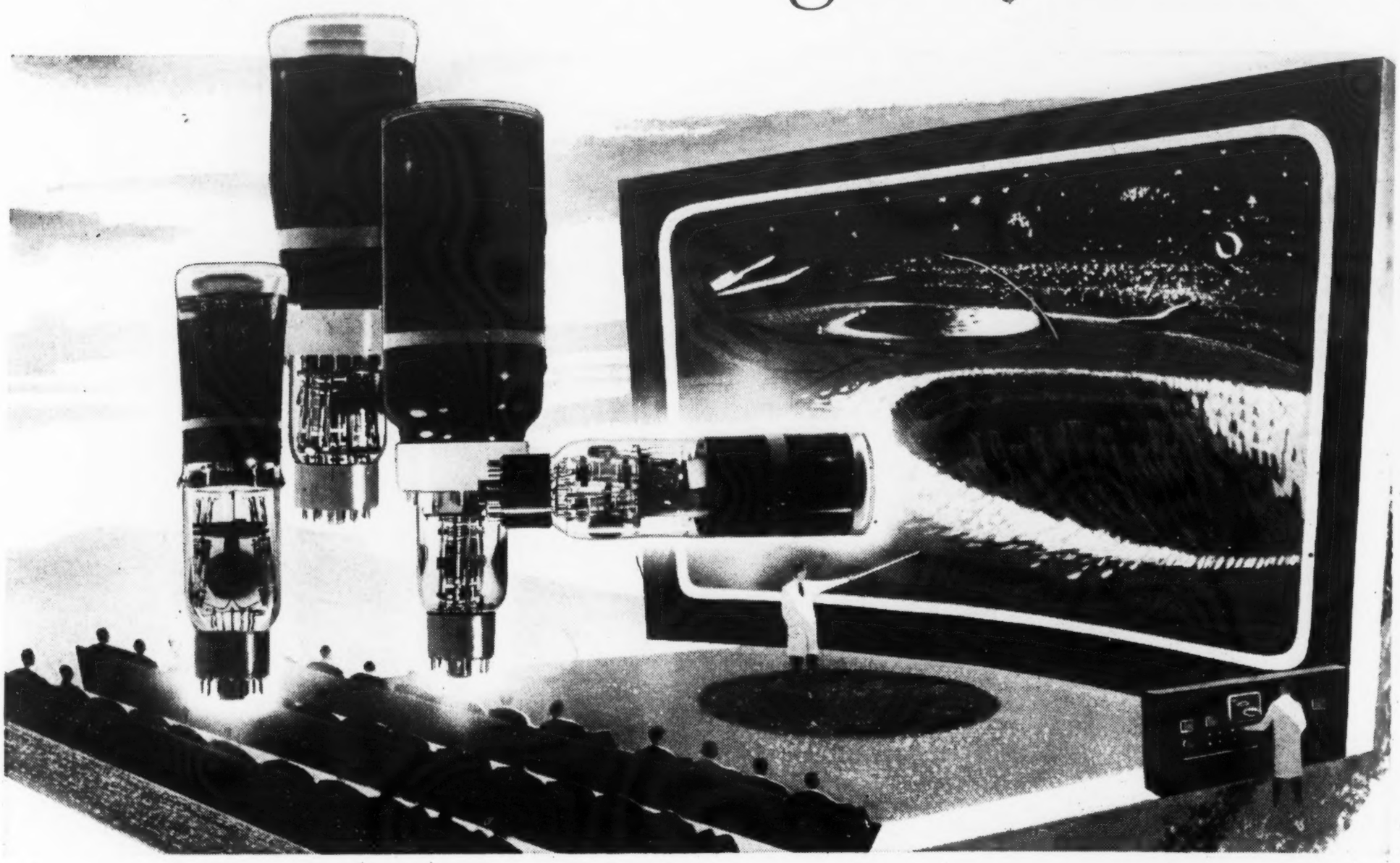
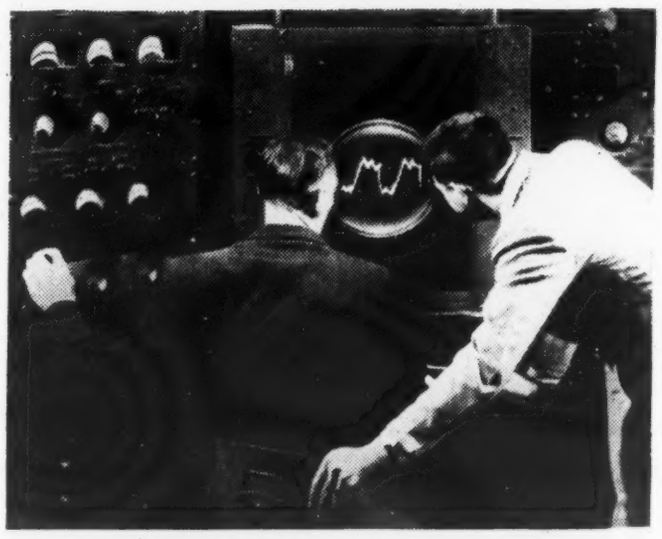
DuMont *Research* gives you more!



The Wonders of Tomorrow—at Du Mont Today!

Right now, Du Mont Laboratories are producing cathode-ray tubes that perform unbelievable wonders. Here are tubes that make it possible to multiply light 10,000,000 times . . . measure time to 1/100.000,000th of a second . . . store up and recall 50,000 different facts!

With the full possibilities of these amazing tubes yet unknown, science, industry and defense look to the Du Mont Research Laboratories for future electronic marvels. Here, also, men seeking a career in electronics will best realize their ambitions. For Du Mont permits no limit on progress in this great new field.



WINDOWS TO TOMORROW

At this testing point, Du Mont scientists predict the capacities of new tube marvels. They are then returned for further improvement, or advanced to commercial production.

DU MONT

first with the finest in Television and Electronics

Allen B. DuMont Laboratories, Inc., 760 Bloomfield Ave., Clifton, New Jersey

Many Little Ones in Our Business

Ninety-five out of every hundred telephone calls are local. Average sale is smaller than the neighborhood drug store or grocery store.

When you think of the Bell System you're likely to think of some big figures. But we're pretty much of a small-town business and our average sale is small.

More than nine out of every ten cities and towns in which we operate have less than fifty thousand population. Ninety-five out of every hundred telephone calls are purely local.

The Bell Telephone Companies own property locally, pay taxes locally and hire local men and women.

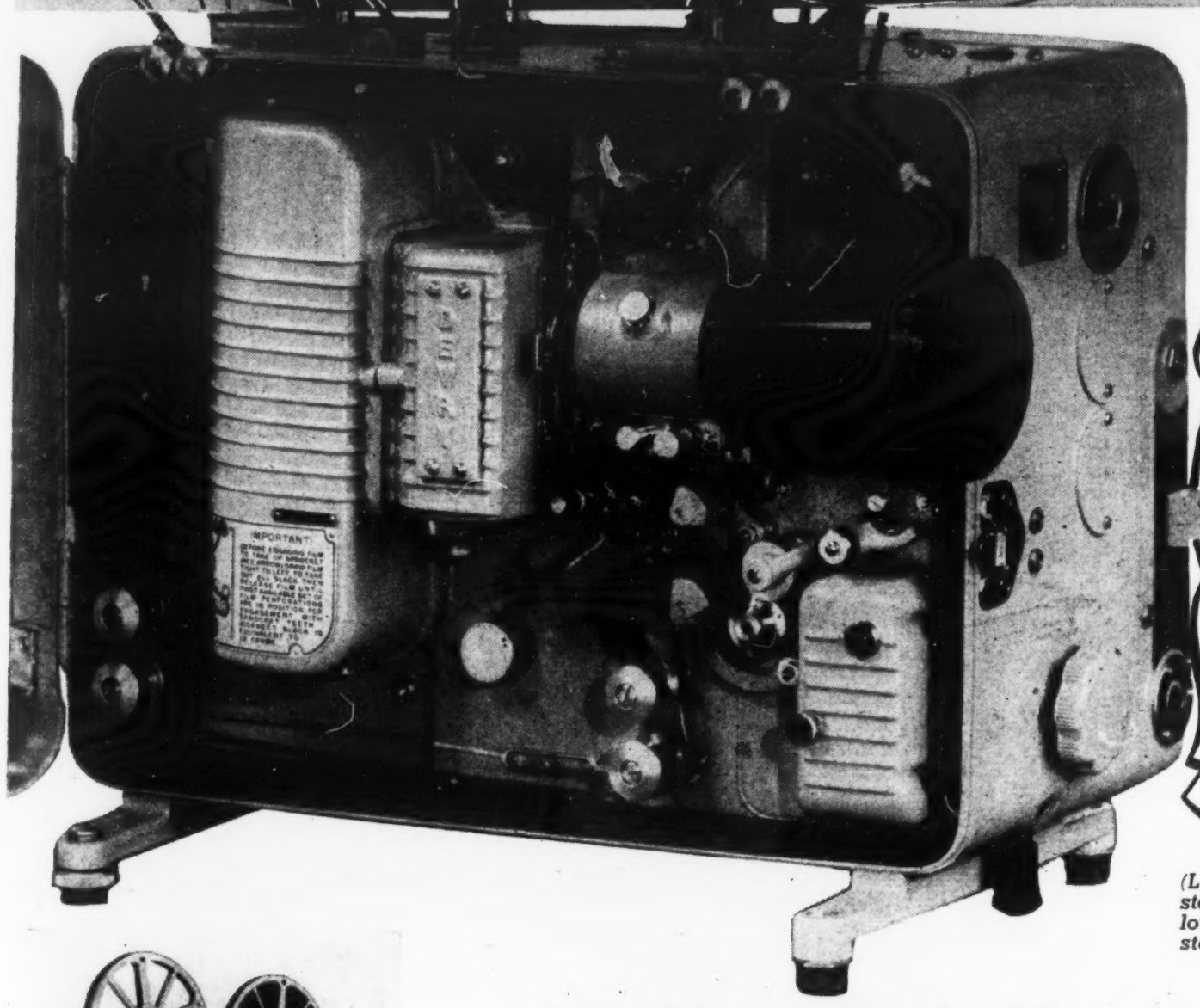
The Bell telephone business is owned by people living in cities, towns and rural areas all over America. It is as much a part of the community as Main Street.

Matter of fact, our average sale is smaller than the neighborhood grocery or drug store. For toll and local calls combined it averages only 7 cents.

BELL TELEPHONE SYSTEM

LOCAL *to serve the community.* NATIONWIDE *to serve the nation.*

Here's the Portable 16 m m. Projector DeVry Developed for the Armed Forces to Bring 16 m m. Sound Movies on a Par with 35 m m.



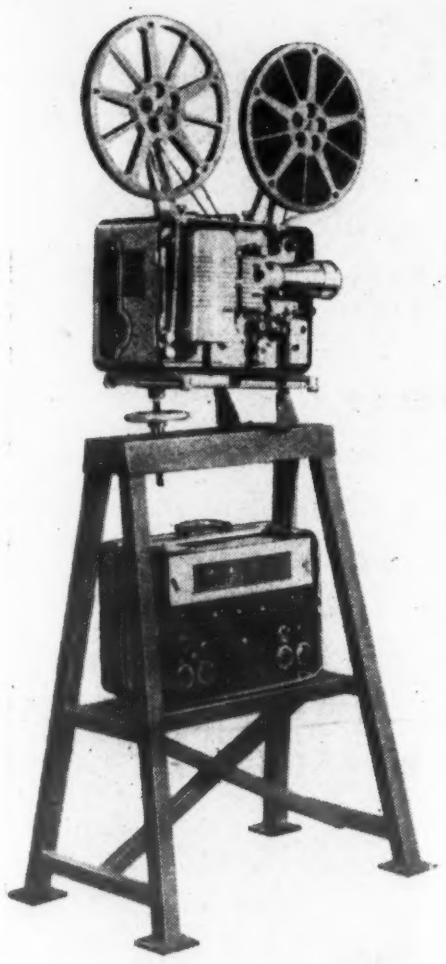
DeVry

JAN*

(*Joint Army-Navy 16m m. Projector)

One of the truly great projector achievements in sound motion picture history.

(Left) Single Case DeVry JAN—the Navy's standard AQ-2(1) projector. Add an external loudspeaker and it becomes the Army's standard AS-2(1) 16mm projector set.

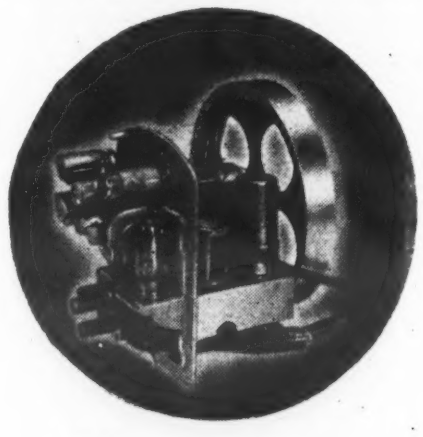


Armed Forces Standard Projector Sets Many Firsts!

The DeVry JAN, the Armed Forces standard 16mm projector, is the only ruggedized, simple-to-use, portable projector using incandescent illumination to afford pictures on screens 12 to 16 feet wide, with 'throws' as long as 150 to 175 feet—**without loss of light.**

In sound, the DeVry JAN offers the improved distortion-free lead sulphide photo resistive cell, flutter factor of only 0.2 to 0.25%, signal-to-noise ratio of —60 db, scanning beam uniformity of ±1½ db, low distortion (only 2%), wide-frequency range amplifier. It takes a brochure to describe all of the many advanced features, but in one demonstration you'll know why the Armed Forces 16mm training and recreational 16mm sound movies are looking and sounding like 35mm presentations. There's nothing like the DeVry JAN, really!

Over 10,000 DeVry JAN Projectors in use by the U. S. Armed Forces.



Magnetic-Optical Sound Head For DeVry JAN

Designed for quick and easy field installation to existing DeVry JAN 16mm sound projectors. Foolproof push-button controls for reproduction of optical sound tracks as well as the recording and playback of magnetic sound on 16mm motion picture film. Complete details on request.

(Left) Three-case DeVry JAN—The Army's standard AN/PFP-1 and the Navy's standard IC/QEB-1D 16mm equipment. Three separate portable cases, a 16mm sound projector, a 20-watt amplifier and a 25-watt loudspeaker (not shown). Mounting bases for booths.

in 16mm sound projectors DeVry means the finest

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The company with a 40-year heritage for leadership in design, development, engineering and manufacturing of motion picture projection equipme t